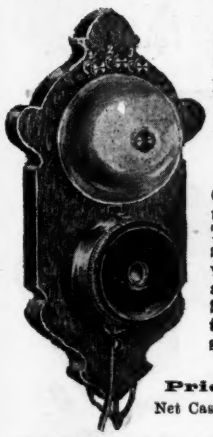
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXIII. No. 1882.] LONDON, JUNE 6, 1899. [51ST YEAR. PRICE 6d.

STENTOR TELEPHONES.



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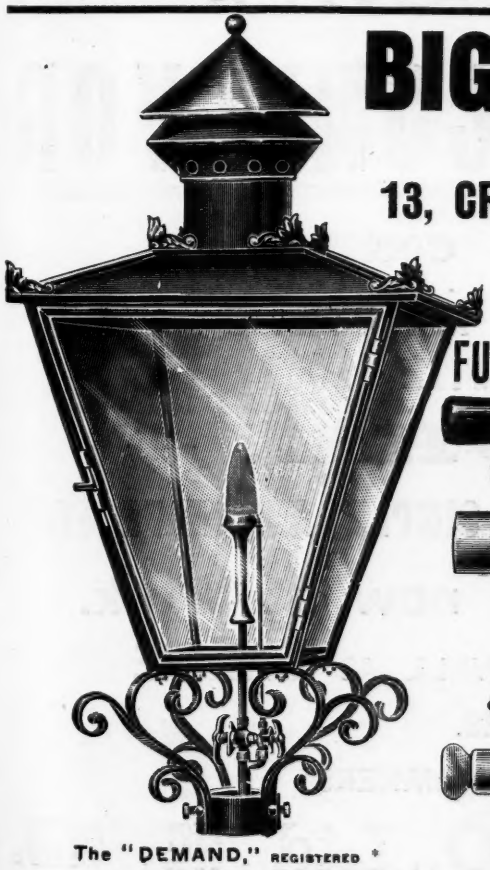

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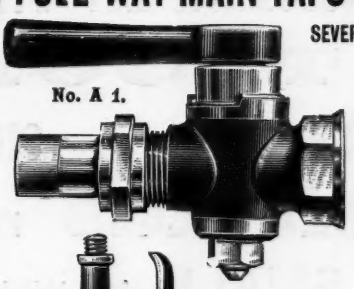

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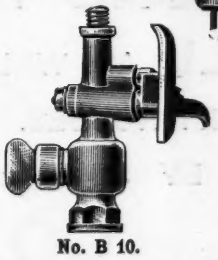
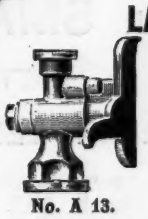


No. B 10.



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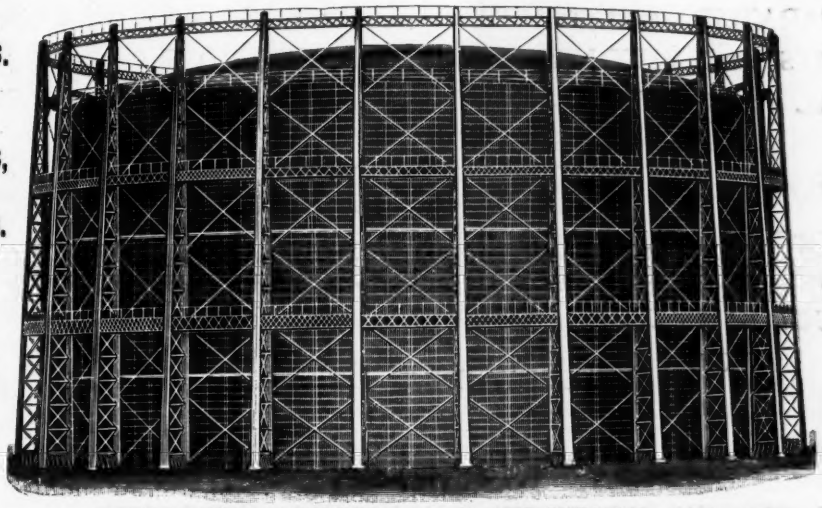

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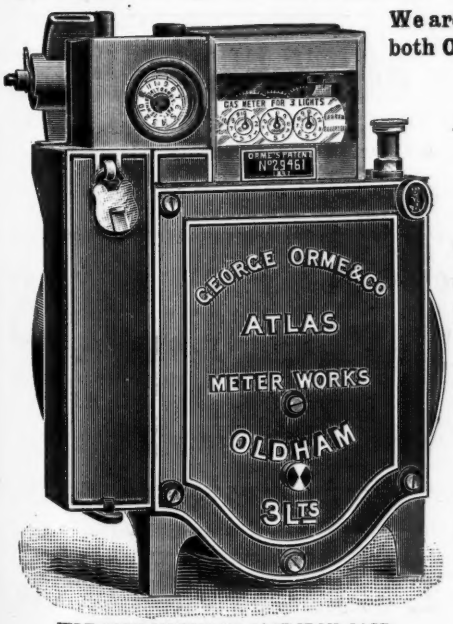

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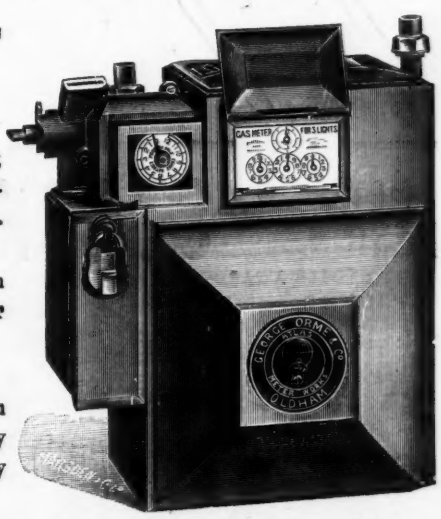

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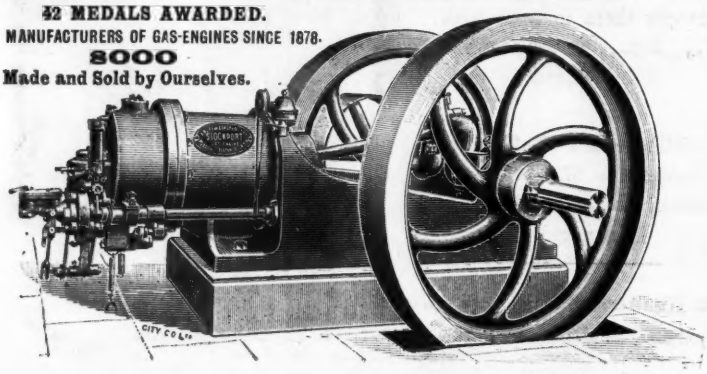

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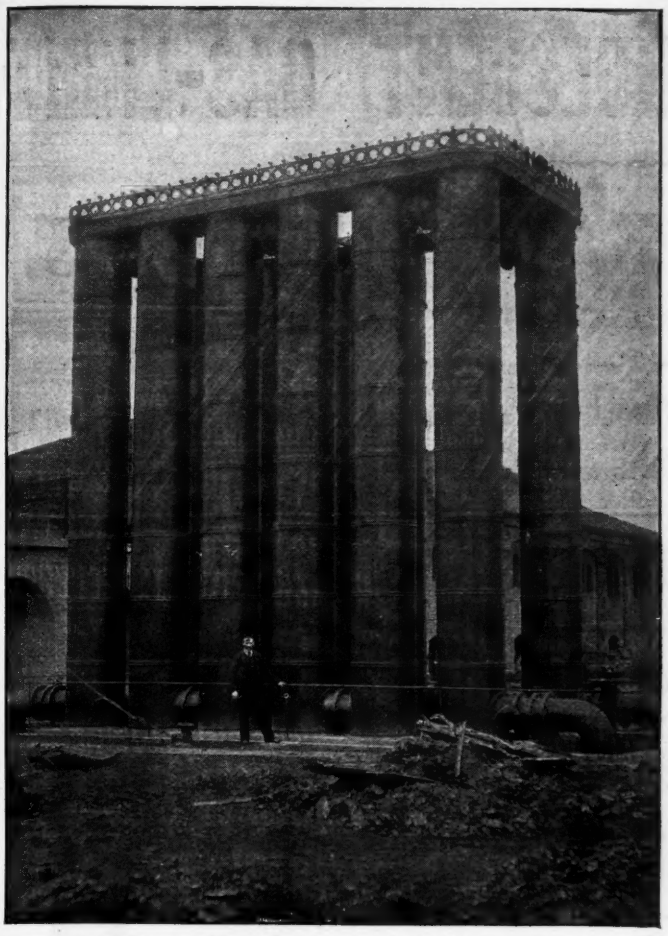

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NEW WELSBACH BURNERS.

25 Candles per Cubic Foot of Gas.

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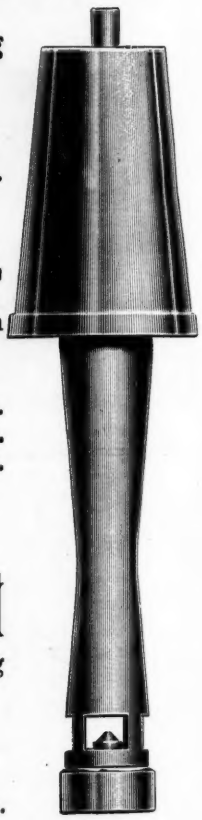
The New Welsbach Burner is supplied in SIX Sizes, consuming from ¾ to 7 Cubic Feet of Gas per Hour.



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100 CANDLE POWER WITH 4 CUBIC FEET OF GAS.

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Enables the New Welsbach Burner to be used for Street Lighting or otherwise, notwithstanding the severest vibration.

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Illuminating Power	38·22 candles
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Illuminating Power	17·8 candles.
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THORNLEY GAS COALS
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Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
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For Price, &c., apply to the
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THE PATENT
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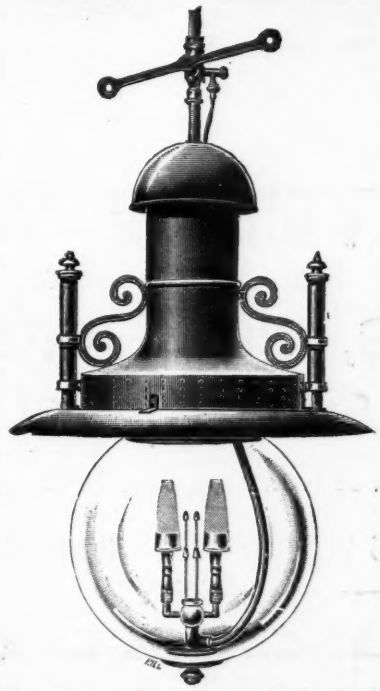

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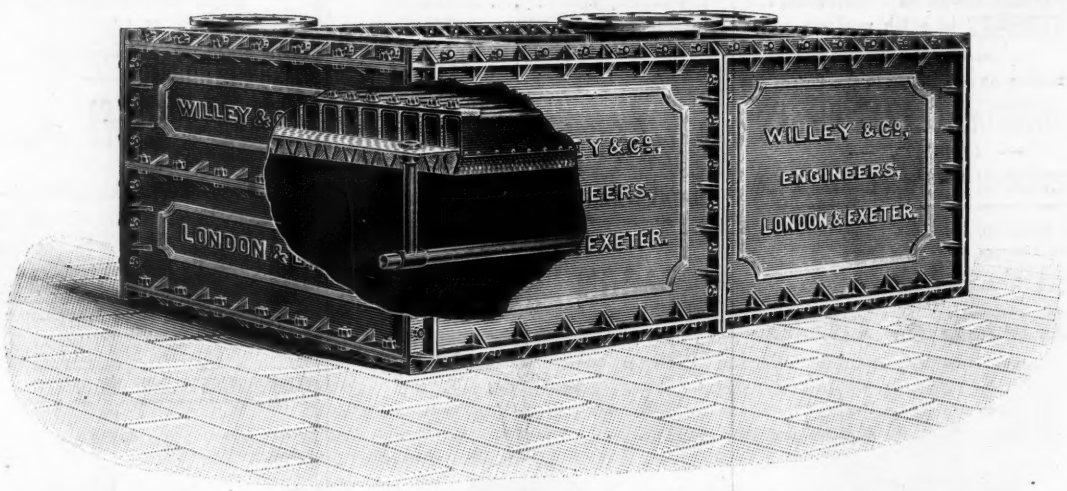

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Tens of Thousands in use, and adopted exclusively by many Gas Companies.

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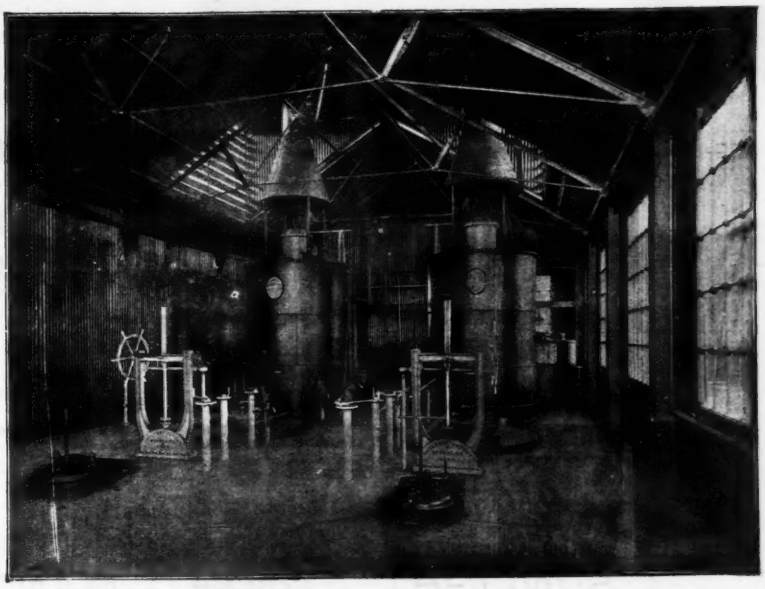
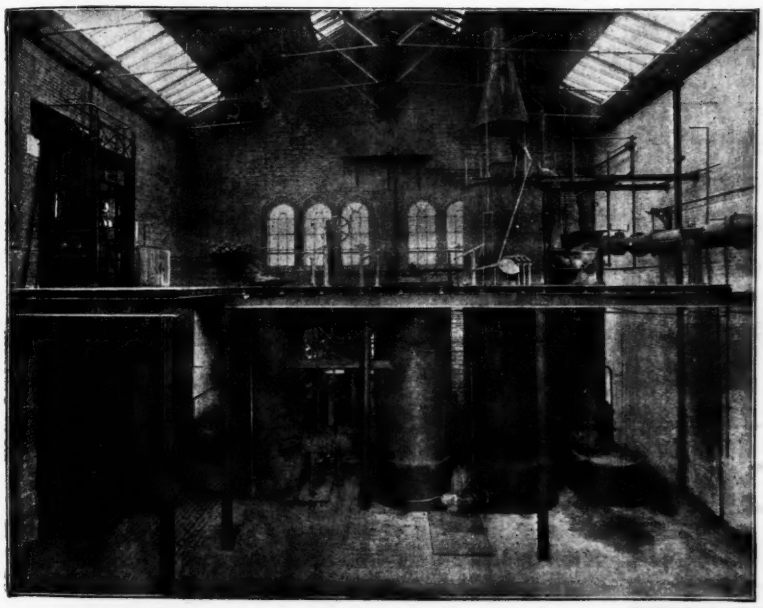


Water-Gas Plant at Southall.



Water-Gas Plant at Folkestone.

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EVERY DESCRIPTION OF GAS-WORKS APPARATUS.

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Applications for **AGENCIES** now being received.

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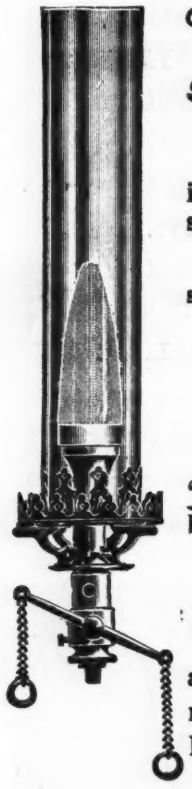
A1. WHITE MANTLES.
Longest Lived and Highest Candle Power.

"SUNLIGHT" TINTED MANTLES.
Strongest and Pleasantest Colour.

These are **INTERCHANGEABLE** on same Burner.

BURNERS WITH CHIMNEYS.
Cheapest in the Market.



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Cheapest, Simplest, and Most Efficient.

SELF-LIGHTER.
Only Efficient System.

A great sensation with this unique combination of features is promised to our Agents for the coming season. Any firm of standing, applying early enough, will be very favourably dealt with.

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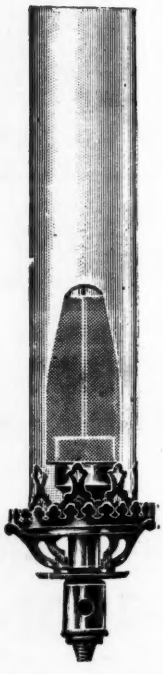

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Sunlight Tinted Mantles have been declared by the Courts to be "as far asunder as the Poles" from the Welsbach System, and we beg to assure our Customers on the advice of eminent Counsel that

SUNLIGHT WHITE MANTLES

also are NO Infringement of that or any other Patent, but are made under a Series of Independent Patents, and by an entirely New Process.

We give with every Mantle sold an absolute indemnity to both seller and user against all molestation on this account.

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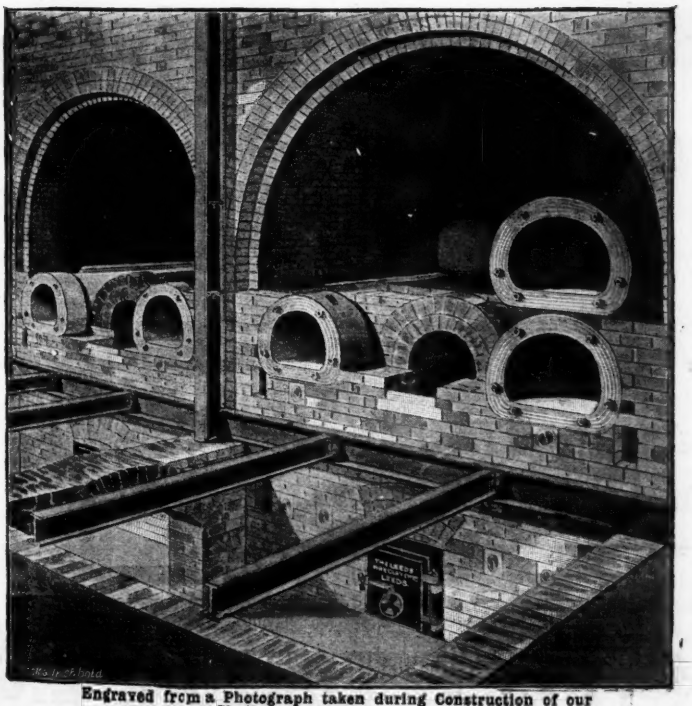

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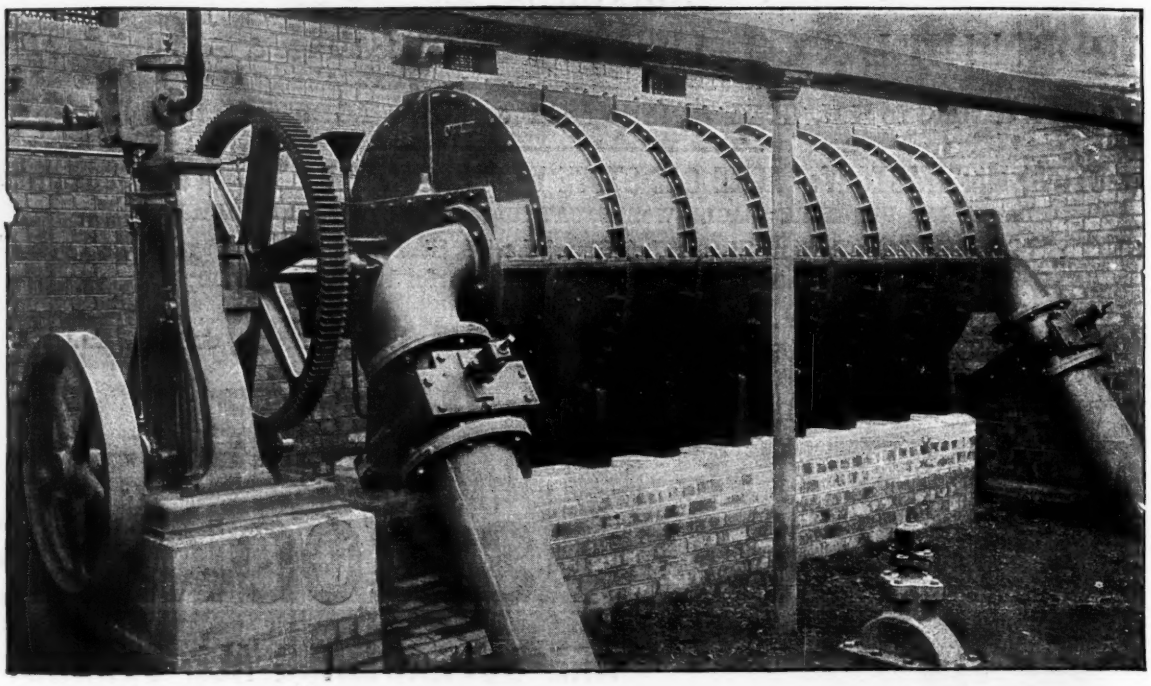

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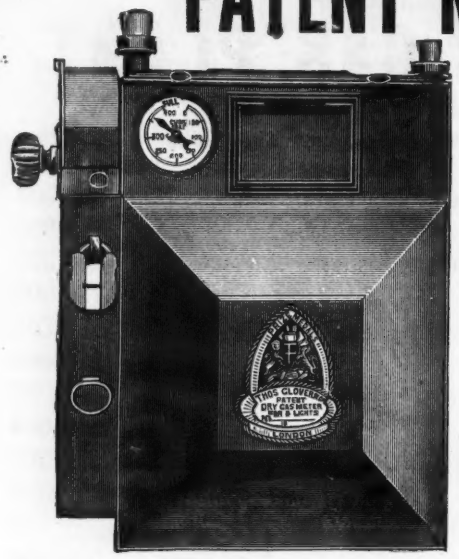

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CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

Settlement of the Dispute in the Building Trade 1477
Report of the Chief Inspector of Alkali, &c., Works 1478
The Term of Municipal Loans 1478
Progress of the Companies Bill 1478
Local Authorities and the Labour Market 1479
The Founder of the Welsh Steam Coal Trade 1479

WATER AND SANITARY AFFAIRS—

Withdrawal of the London Water (Purchase) Bill 1479
The Registrar-General and the Bateriscopic Examination of Water 1479

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market 1480
Electric Lighting Memoranda 1480
A View of Illuminating Gas Statistics 1481
Up-to-Date Lighting at the Crystal Palace 1482
Workmen's Benefit Societies—Concluding Article 1483

NOTES:—

Paint for Floors and Damp Walls 1485
Gas Pipes in the Soil 1485
The Improvement of Portland Cement by Trass 1485
A Peculiar Well 1485
The Burning of Carbon 1485

TECHNICAL RECORD:—

Elevator and Cable Tramway, Crindau Gas-Works, Newport (Mon.) 1486
Midland Association of Gas Managers—Excursion Meeting at Eilston 1487
Manchester District Institution of Gas Engineers—Excursion Meeting at Kendal. The Kendal Gas and Water Works . . 1487
British Association of Water-Works Engineers—Annual Meeting in London—Inaugural Address of Mr. W. Watts, F.G.S., &c. . 1489

REGISTER OF PATENTS:—

Atmospheric Burners—Smith, W. B. 1492
Gas-Burners—Hall, G. A., Owen, E., and Dayton, G. E. . . . 1492
Automatic Prepayment Mechanism for Controlling the Supply of Electricity or Gas—Hughes, J. 1492
Prepayment Gas-Meters—Abel, C. D. (T. T. Somerville) . . . 1493
Charging Gas-Retorts—Abel, C. D. (Société Anonyme Continentale pour la Fabrication des Compteurs à Gaz) 1493
Pumping or Compressing and Mixing Gas and Air—Keith, J. . . 1494
Gas Water-Heaters—M'Cartney, J. 1494
Manufacture of Incandescent Mantles—Voelker, W. L. . . . 1494
Automatic Gas Lighters—Dymond, G. C. (Trendel, F.). . . . 1494
Patent Notices 1495

CORRESPONDENCE:—

Trading Firms and The Gas Institute 1495
Preventing Explosions When Cleaning Dip-Pipes 1495

PARLIAMENTARY INTELLIGENCE:—

House of Lords—Progress of Bills 1495
House of Commons—The Withdrawal of the London Water (Purchase) Bill; Progress of Bills 1495
House of Commons Select Committee—The Powers of Charge of the Metropolitan Gas Companies 1496
The Contest for the Derwent Watershed 1496

MISCELLANEOUS:—

An Explosion at the Bankside Gas-Works 1498
Industrial Exhibition at the Crystal Palace 1498
Welsbach Incandescent Gas-Light Company, Limited—The Directors' Report 1498
The Imperial Continental Gas Association and the Vienna Municipality—A Municipal Scandal 1498
The Report of the Chief Inspector under the Alkali Acts . . . 1499
Lancaster Corporation Gas Supply—The Annual Accounts of the Gas Department 1500
Kendal Corporation Gas and Water Supply—Annual Report . . 1500
The Management of the Longton Gas-Works 1500
The Public Lighting of New Haven (Conn.) 1500
Beverley Gas-Works Extensions—Local Government Board Inquiry 1501
Sales of Stocks and Shares 1501
Electric Lighting Notes 1501
Value of Land for Reservoir Purposes—Arbitration Proceedings . 1502
The Mechanical Filtration of Water 1503
Notes from Scotland 1504
Gas and Water Companies' Stock and Share List 1504
Current Sales of Gas Products 1506
Coal Trade Reports 1507

PARAGRAPHS:—

PERSONAL: Mr. R. M. Couper; Mr. A. Drage; Mr. R. Robinson; Mr. W. J. Moore; Mr. Alexander Smith 1484
Sunday Carbonizing in Gas-Works—Revival of the Gas Question in Paris 1480
Coal near Calais 1482
The Acetylene Exhibition and Congress at Buda-Pesth 1486
Gas *v.* Electricity for Lighthouses 1492
Public Lighting by Acetylene—Labour Trouble at the Darlington Gas-Works 1502
New Joint-Stock Companies 1507
Farnham Gas-Works Purchase Question—Increase in the Price of Gas at Cullingworth—Suggested Abolition of Water Gas at Birkenhead—Coventry Corporation Water Accounts—Reductions in Price—The Southampton Corporation and the Local Water Bills—The Exeter Gas Company's New Holder—Municipalities and Labour Interests—Suicide by Coal Gas—Rochdale Corporation Gas Supply 1508
Municipalization of the Morecambe Gas Supply—Tipton Gas Supply—Gas Supply in the Suburbs of Cape Town—The Sale of the Rayleigh Gas-Works—Continental Union Gas Company, Limited—Additional Water-Mains for Margate—Cape Town and District Gaslight and Coke Company 1509
English Coal for the Paris Gas Company—The Proposed Municipalization of the Ossett Gas-Works—The Bridlington Water-Works Loan—The Lighting of Festiniog—Bury Corporation Gas Supply—A Huge Loan for the Birmingham Corporation Water Department 1510

EDITORIAL NOTES.

Settlement of the Dispute in the Building Trade.

IT is reported that the Plasterers' strike has been happily terminated, before spreading to the other building trades, by the good offices in mediation between the men and the Master Builders of the Editor of the "Daily News." After much beating about the bush by the two parties to the original dispute, but without any result, matters came to a climax at the meeting of the National Association of Master Builders in Birmingham, about a month ago. It was then agreed that all the other Unions connected with the building trade should be asked point-blank to disavow sympathy with the Plasterers, on pain of a general lock-out. Such a decision appears arbitrary at first sight; but the fact was that the affair of the Plasterers threatened to become chronic, and it was deemed expedient to apply a touch of caustic to the sore. The effect was in accordance with expectation. The Unions promptly protested against the overbearing action of the masters; but secretly one and all in the threatened trades felt that it was high time for something to be done, with or without the official representatives of the Plasterers, who were impracticable. Someone at this juncture put up the Editor of the "Daily "News" to interfere, with the laudable desire to avert the catastrophe of a national strike of builders; and he found the parties very willing—not to say anxious—to meet on neutral ground. A conference was therefore arranged, at which Mr. E. T. Cook presided. Having opened the proceedings, he was about to withdraw and leave the delegates to discuss their differences; but, greatly to his surprise, he was asked to remain and preside over the business meeting. The result was as great a success as if Lord Rosebery, Lord Justice Fry, the President of the Board of Trade, or any other high functionary of State, had had the job in hand for as many weeks as Mr. Cook gave hours to the task. All the points in dispute were disposed of somehow. There was a good deal of "golden bridge" building in the proceedings; but when all hands are heartily sick and tired of a state of war which never comes to actual fighting to an issue, the precise drafting of the treaty of peace is not very material. The main fact is that the conference broke up with hand-shaking all round, after the signing on behalf of the Plasterers' Union and the Master Builders' Association of a new "settlement," which may or may not stand wear and tear. As our contemporary remarks, in a modest editorial article on its triumph, it is satisfactory to know that newspapers, which have not seldom been accused of "fostering and feeding the war spirit," may at times play the useful part of the Peacemaker.

But then not all daily newspapers are so candid and truth-seeking as the "Daily News," for all its political and other prejudices, usually shows itself to be. Especially in questions of "Progressive" or "Labour" politics, the Newspaper Press is prone to follow what appears to be the "popular" lead for the moment. Militant Trade Unions, suffering from what is known in America as "swelled head" on the part of their leaders, have too often been bitterly deceived by the appearance of newspaper support. The Welsh quarrymen, the Engineers, and others, have formerly been hounded on the path of revolt by hare-brained newspaper writers who have dropped their cause the moment it seemed to weaken. Let us hope that this action of the Editor of the "Daily News" heralds an entirely new order of dealing with industrial problems by the popular Newspaper Press of this country—an order of careful inquiry into, and faithful recording of the facts, before any attempt whatever is made to lead public opinion on the issue. Hitherto, only "The Times" has performed this service to the body politic; and the "leading journal" is not accessible by the general public of newspaper readers. The daily newspapers have been receiving some wholesome advice of late, as to the kind of matter that ordinary people really like to have supplied for their matutinal and evening reading. Put as shortly as possible, the request is for "true, fresh news." People buy newspapers for many reasons; but they all want the same quality of news. In regard to labour questions, for instance, while the facts of a real dispute may be well worth learning, nobody wants to know what the Permanent Grand Secretary of the National Amalgamated Shirkers thinks of the prospects of the strike he is trying to bring off, with no risk to himself.

The Press "interview" is a quick way of making "copy" for the reporter; but it is easily overdone. Meanwhile, we must congratulate Mr. E. T. Cook and Mr. Clement Edwards, of the "Daily News," upon the happy result of their timely intervention between the Master Builders and the men of the Building Trades Unions. It is to be hoped that the agreement now arrived at will be kept in the spirit and to the letter. There is some hope of this in the circumstance that several impartial men, with full command of the weapon of publicity, will be in a position to denounce traitors from their own knowledge. Not the least satisfactory feature of the affair is the absence of members of the stock company of Labour Leaders from the conference—perhaps one reason for its success.

Report of the Chief Inspector of Alkali, &c., Works.

THE thirty-fifth annual report to the Local Government Board by the Chief Inspector under the Alkali, &c., Works Regulation Acts, has just been issued. It is as replete as usual with instruction for those concerned in the management of the factories subject to inspection under the Acts; but this time there is not very much discussable matter in the observations of Mr. R. Forbes Carpenter and his able staff. There was only one prosecution last year of a firm manufacturing sulphate of ammonia; and this was for discharging sulphuretted hydrogen into the works chimney, without any attempt to change its noxious character or to arrest it in any way by temporary means—the purifying arrangements in regular use being unavailable through stoppage of other plant. It was an old-established works; and it was evidently thought by the Court that the offenders ought to have known better, for they were smartly fined. The work of the Inspectors under the Acts has always been regarded as being something far more than the mere detection of offences. These officers have throughout aimed at helping manufacturers to obey the law; and with regard to sulphuric acid works, the owners at first depended upon the Inspectors for information as to the efficiency of their apparatus. This reliance upon these officers is being reduced by the greater co-operation of managers in the observance of the requisite precautions for securing efficient working, and the avoidance of nuisance. Fortunately, in most chemical trades the two things now go together, as nuisance generally means waste. Several of the District Inspectors testify to the vigilance that is necessary on their part in preventing, or at any rate in minimizing, the nuisance that is apt to occur from the distillation of ammoniacal liquor. The Chief Inspector finds it necessary to again emphasize the importance of so arranging the plant for cooling the gases from the sulphate of ammonia saturator that the water condensed is taken off at the hottest possible point, and so associated with the minimum of sulphuretted hydrogen and of pyridine. Works where this requirement is not fulfilled will not be registered.

It is important to note that the Chief Inspector's statistics of the production of sulphate of ammonia in the United Kingdom exhibit a decrease of the total output for the past year. This is the first time since these statistics were presented in the reports that a reduction in place of an increase over the previous year's figures has been recorded; and the fact is of more than passing interest. The Chief Inspector ascribes the falling off in the output of sulphate from gas-works to the increased production of water gas, which does not yield an appreciable amount of ammonia. Also, the mild open winters are credited with some of the effect recorded. It does not follow that the sulphate production of the whole of the United Kingdom, which fell in the past year from 198,280 tons to 196,357 tons, is never likely to be increased again. "Recovery" coke plants are growing in numbers every year, although ironmasters are not by any means unanimous in favouring the coke so made. The Chief Inspector remarks upon this point that "it is with some ironmasters a matter of the highest de-"sirability to avoid variations in percentage of moisture; "and the method adopted in beehive-oven coking of quench-"ing the coke before withdrawal from the oven, offers great "advantages in obtaining regularity in this respect." Still, the smallest "shortage" of sulphate supply is certain to exert an altogether disproportionate effect upon the market price of the products; and this will in turn encourage its manufacture from all possible sources of ammonia.

The Term of Municipal Loans.

LAST Friday, in the House of Commons, on the vote for the Local Government Board, Sir Albert Rollit drew attention to the question of the varying character and restricted length of the terms of repayment of loans for municipal and other public works. The spokesman of Municipalism discoursed at large upon the hindrances put in the way of Local Authorities borrowing for various purposes. He was supported by other speakers, who showed that the necessity of providing for the repayment of loans for some purposes made the capital charges of municipal enterprises higher than the objects can conveniently bear. One is reminded of the part taken by the late Sir Stafford Northcote in procuring the authority of Parliament for shortening the period of repayment of these loans, on the ground that sinking funds of from sixty to a hundred years tended to encourage municipal extravagance. On the other hand, the restriction of all County Council towns to a uniform period of thirty years is hard upon some cases. There is nevertheless a good deal of reason in the idea that Local Authorities ought not to be permitted to lay upon posterity burdens which should be borne by the present generation. Posterity will have their own needs to provide for. This is the view of the Local Government Board. Mr. Chaplin was very sympathetic as regards the sanitary expenditure which his Department frequently compels Local Authorities to incur; but he was equally firm in upholding the short-period loan as a check upon extravagance. So strong was the case of the Department, that Sir Albert withdrew his motion. Here the matter ended for the time; but it may not be regarded as unreasonable to ask the Local Government Board, in view of the enormous recent growth of local indebtedness, to discourage Local Authorities from embarking upon the trading and speculative undertakings which possess such great attractions for many of these bodies. It is necessary, nowadays, to raise the protest that good local government is not necessarily synonymous with public meddling in matters of business. The idea of saving the rates seems to be given up; and the only cry is for some remunerative venture which shall return a "profit" that may be set against the rates. Economical administration is nowhere as compared with "Progressive" municipal trading. If Municipalities could put off the repayment of all their loans to a hundred years, there would be no bounds to their "enterprise" at the expense of those who must come after us. A charge of 4½ per cent., or thereabouts, for interest and repayment, is a "steadier;" and even this is incurred far too lightly in many instances.

Progress of the Companies Bill.

THE Companies Bill has emerged from Committee in a different guise from that of the original departmental draft. How far the alteration is improvement, may be a matter of opinion. Discussion of the clauses in Committee has elicited much additional information respecting the powers of the existing law; and consequently numerous provisions found to be already covered have been expunged from the Bill. Still, the main lines of the original scheme have been preserved. Prospectuses of new Companies must state the minimum subscription upon which the Directors may proceed to allotment; and if no such minimum is named, the whole of the share capital must be subscribed. The sums payable on application and on allotment must be together at least 5 per cent. of the nominal amount of the shares, and must be payable within forty days of the first issue of the prospectus. If these conditions are not fulfilled within the stated period, all money received from applicants must be returned to them, on the joint and several responsibility of the Directors. This will cure one of the chief evils of the present system of Company finance. No Company may commence business or borrow money without a statutory declaration that three-fourths of the sum due on application and allotment has been received in cash by the Company. The Select Committee seem to have been anxious not to make Directors' responsibility too onerous to be endured by the right class of men; while care has been taken to penalize wilful and conscious default. The Bill may be still further altered before it becomes law; but in any case it is not likely to be made milder for Directors, promoters, and officials of Companies. A promising provision has been made for the "happy despatch" of such unhappy ventures as fail from their birth. The time for holding the statutory meeting is fixed at three months; and if this is not done, shareholders may petition the Court for a winding-up order, after the expiration of fourteen days. The Court may make such order as it thinks fit,

and condemn in costs the persons responsible for the default in holding the meeting. Short of trying to prevent the parting between fools and their money, which would be a vain attempt, the Companies Bill appears to do all that experienced public opinion indicates as desirable in the way of reform.

Local Authorities and the Labour Market.

VERY grave complaints are being uttered as to the manner in which some British Municipalities endeavour to dominate the labour market, not only by extending direct employment, but also by dictating to contractors how they shall deal with the men employed in filling their orders. No good will come of scolding these interfering Corporations, and still less of crying "Socialism," or any other catchword of the hour. The only course for those critics of such aberrations as really and truly desire to serve the public interest, without ulterior motive, is to exhibit every instance with strict reference to the principle involved. Honest manufacturers and traders are quite as interested as members of Municipalities in keeping Corporation contracts out of the hands of contractors of the "sweater" class. This is not an easy task, having due regard to the prime duty of accepting the lowest unexceptionable tender. Investigation of the *bona fides* of tenderers is not always productive of reliable guidance; and the temptation is strong to make sure, at least, that an inviting price has not been rendered possible by cutting wages, which means bad work. This is a matter that representative municipal magnates might well discuss with the leaders of industry. As it is, the terms of municipal contracts for some supplies and services are often so drawn as to repel the best class of contractors, and too frequently to play into the hands of professional Trade Union wire-pullers. The members of Local Authorities are of all sorts. Most of them, doubtless, are well-meaning persons, desirous of doing what is right as between master and man; but others are mere sycophants of the "Labour" voter. The leading case of Messrs. Yarrow and the London County Council is sufficiently familiar. It is reported more recently that the kind of restrictions which were unacceptable by this firm are being inserted into contracts for supplies of other things besides machinery. By-and-bye, possibly, the London County Council will not pay a gas bill unless the undertaking supplying the gas is conducted under Trade Union auspices. Oddly enough, this new tyranny is conveniently tempered by recourse to foreign sources of supply, in regard to which the municipal solicitude for the claims of Labour must needs be silent. Thus it is rumoured that one influential public body, foremost among the advocates of "Labour clauses," buys cement from Belgium. Nothing more is needed to complete this satire, except the information that the foreign cement is cheapened by exported English gas coke.

The Founder of the Welsh Steam Coal Trade.

IT must have been with more than a little surprise that readers of "The Times" yesterday learnt of the death on Saturday of Mr. John Nixon, the founder of Nixon's Navigation Coal Company, and the first introducer of Welsh smokeless steam coal to London and the naval and mercantile marines of the world. It is a hackneyed saying that "the world knows nothing of its greatest men;" but the adage was never more justified than in regard to the truly great mining engineer, merchant, and adventurer—in the best sense of the word—who remained with us until last week. What London, the British Navy, and other fuel users owe to Mr. Nixon's enterprise was only too conspicuously illustrated last year, when the customary supply of Welsh steam coal was interrupted by the colliers' strike. It seems very wonderful that this trade was actually created by the man who died last Saturday. Mr. Nixon was a Durham man; and it is therefore all the more remarkable that it should have been left to him to persuade the fuel users of the world that the South Wales product is the best of its kind. When he began his enterprise, though the British Navy was on the point of conversion from sails to steam, it was the French Government that first perceived the merits of Welsh coal. A few Thames steamboats used the fuel; but the whole output was not more than 150 tons per day. It is scarcely credible that this was the case in the lifetime of men only now passing away. Of course, everything as well as everybody was against Mr. Nixon. The Welsh colliery people would have nothing to do with him; and the Great Western Railway flatly refused to carry coal. Eventually, Mr. Nixon was able to sink for coal on his own account; and the smokeless steam coal trade of South Wales became what it is to-day. It is difficult to classify such a man. He can only be accounted for by giving him a place among the formative processes of Nature. He and his like are elemental powers. The record of their endeavours and successes is not so much inspiring as it is impressive. The average man feels that he could no more do their work, by taking thought, than he could raise the chain of the Alps or start the Gulf Stream. Truly, when the record of the fast-closing century is properly written will it be said, as of an older time, that "there were giants "on the earth in those days." There will be the difference, however, that the nineteenth century giants left marks behind them, to testify both to the fact of their having existed, and to the kind of work they found to do.

WATER AND SANITARY AFFAIRS.

WHEN the London Water (Purchase) Bill of the County Council came before the House of Commons, on the 27th ult., for second reading, Mr. Stuart, it will be remembered, pleaded for a postponement till the 1st of June, in the hope that by that date the report of the Royal Commission would have appeared, or possibly someone would be able to give an indication of the views held by the Commission on the subject of purchase. If this were recommended, then keeping the Bill alive would save a session. Mr. Stuart was fortunate in having on his side the Chairman of Committees—the Right Hon. J. W. Lowther—who thought a case for postponement had been made out. At the same time, he called the attention of the honourable member and the House generally to the fact that other parties besides the promoters of the Bill—viz., the London Water Companies—were interested in this question; and therefore it must be distinctly understood that on the 1st of June the House would really "see the last of the Bill," either by its passing or its rejection. Mr. Stuart saw the force of these remarks, and acknowledged that he could not go on asking the House to continue to postpone the Bill indefinitely. The House yielded to the pleading; but we think there was a pretty general opinion that the Bill was doomed. Whitsuntide—the date indicated for the possible publication of the report of the Commission—has passed, and no report, and not even an indication of its tenor by those who are "in the know," has appeared. Under the circumstances, Mr. Stuart last Thursday could only ask the House to allow the Bill to be withdrawn. This course was not silently assented to; for Mr. Whitmore, who had a motion on the paper to reject the Bill on the grounds of general policy, confessed that it would have afforded him pleasure to move it. He expressed the hope that when the subject was next brought forward it would be in a Bill promoted by the Government, so that the question could be settled for ever. Mr. Stuart retorted by throwing upon the Government the responsibility for hindering such a settlement; the Commission they had appointed being really the impediment to its realization. With this little passage of arms the subject dropped, and the last of the Bill was heard for the present session.

The Registrar-General's annual summary of the vital statistics of London and other large towns, recently issued (having reference to the year 1898), is marked by a rather singular omission. We have long been accustomed to find in this document a full report by Sir Edward Frankland on the Water Supply of the Metropolis for the previous year. On this occasion the report for 1898 is due, but fails to make its appearance; and the result is that the summary issued by the Registrar-General shows nothing as to the London Water Supply except what may be found in a couple of tables occupying rather less than two pages, recording the quantities of water supplied and the number of services. Thus lightened of its customary load, the summary becomes a comparatively slender document—composed of about sixty pages, in place of ninety. The plan hitherto pursued has been for Sir E. Frankland's report in the Registrar-General's summary to be reproduced in the annual report of the Local Government Board published several months later on. But a change has taken place in this respect also. In May last year the annual summary for 1897 was issued with Sir E. Frankland's report given in full; but in the ensuing autumn—that is

to say, last September—the annual report of the Local Government Board omitted from its version of the report by Sir E. Frankland everything that related to the bacterioscopic examination of water—a subject which Sir Edward had treated in a chapter of considerable length, including an elaborate diagram. In the summary for 1897, Sir Edward's document was entitled "A Report on the "Chemical, Physical, and Bacterioscopic Examination of "the Waters supplied by the Metropolitan Water Com-"panies." In the Local Government Board report for the same year, all we read of is the "Chemical and Physical "Examination." Therefore, when the Local Government Board report for 1898-9 makes its appearance next autumn, we may not hope to find any information about bacteria. From neither of the two official sources to which we have been accustomed to look, shall we be favoured with particulars as to the microbes in London water.

We cannot but think that some explanation is required with regard to this extraordinary mode of dealing with Sir E. Frankland's report. The account is banished altogether from the Registrar-General's last annual summary, and the bacterioscopic portion is cut off from it in the last annual volume of the Local Government Board. It may be conceivable that Sir E. Frankland has himself withheld his annual report from the present summary. But we cannot suppose that he would lop off an important portion from his record in the Blue-Book of the Local Government Board. If Sir Edward is not pursuing a policy of self-abnegation, or if some new and better method of publishing his results is not about to be carried out, we are left to conclude that he is probably encountering some form of official opposition. Are the microbes discredited? During the late inquiry respecting the Metropolitan Water Supply, some remarks were dropped from one or two members of the Commission which seemed to imply a distrust of bacterioscopic results. Such an attitude is to be regretted. Research on the subject of bacteria affords an insight into the real character of water such as chemistry has failed to render. Sir E. Frankland has remarked that the bacterioscopic examination of water used for dietetic purposes has of late years assumed great importance in hygiene. He also observes that, in this way, a test for the efficiency of filtration has been supplied which is far more delicate than that contemplated by the Act of 1852—namely, freedom from opalescence or visible particles in suspension; for this parliamentary test may acquit a water which contains "many millions of microbes in a thimbleful." Difference of opinion may exist among medical authorities as to the degree of importance to be attached to bacterioscopic examination; but to treat it as valueless would be to shut out the light where it ought to be especially welcome.

Sunday Carbonizing in Gas-Works.—Our readers will doubtless remember that a pamphlet on the above subject was brought out in 1897; the object of the authors (Dr. Gritton and Mr. P. Steel) being to present a collection of facts proving that Sunday rest in gas-works is consistent with financial success and conducive to physical and moral well-being. A second edition has now been issued, with considerable alterations and additions; some of the earlier portion of the matter having been omitted, and the latter part being entirely new. The pamphlet will be forwarded to gas managers and others on receipt of a post-card addressed to Mr. P. Steel, Kingswood, Sidcup.

Revival of the Gas Question in Paris.—According to the "Journal des Débats," there is a revival of the agitation on the subject of the price of gas in Paris. A meeting of manufacturers and others was held on the 27th ult. in the Cirque d'Hiver, at which M. Beauregard, one of the Deputies for the city, discoursed on the onerous conditions under which the gas consumers obtain their supply; the price charged being double or treble what it is in Belgium and Germany. A resolution was passed inviting the Municipal Council to study the most practical means of effecting a reduction. The writer in the "Débats" does not wish to discourage those who have initiated this movement; but he questions whether they have acted wisely in applying to the Municipal Council. He reminds these well-meaning people that this body is the sole cause of the existing condition of things. "Nearly fifteen years ago the Gas Company proposed a reduction of price to 15c. per cubic metre, on condition, of course, that their concession should be prolonged several years; but the Council would not listen to it. This explains why affairs have remained stationary, and why, thanks to the obstinacy of the municipal councillors, the Company have continued to charge 30c. for a product they offered to supply for half this price fifteen years ago." The writer adds that the motives which dictated this policy still exist in full force; and that every endeavour on the part of the consumers will be powerless to affect them.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1504.)

Business on the Stock Exchange was interrupted last week by the settlement and the Epsom race meeting, so that markets as a whole were inactive; most attention being directed to mining shares. An easier tendency has prevailed in the Money Market, and discount rates have drooped. In Gas shares there have been a few movements. Among the Metropolitan Companies the only change is a decline of 1 in Gaslight and Coke ordinary to 112-114, and 1 in the 4 per cent. preference to 127-129; but, on the other hand, Crystal Palace ordinary is 3 up, to 133-138. The feature of the week has been the fall of 15 in Continental Union to 195-200 on the interim dividend announcement at the rate of 4 per cent. for the half year on the ordinary stock. The Directors explain that, in return for an extension of the concession by the city of Milan, a large reduction in the price of gas had to be agreed to, which for some period will seriously reduce the profits of the Company. Hence a diminution in the interim dividend is considered advisable. Monte Video and Hong Kong shares are quoted weaker; but Metropolitan of Melbourne shows strength, and is marked higher, at 112-114. Several stocks are now quoted *ex* dividend. With regard to Water Companies' stocks, the market has again been very quiet; the only changes being a rise of 2 in East London ordinary to 220-224, and 3 in Lambeth 10 per cent. maximum to 303-308.

The daily operations were: Gas stocks opened on Monday with a quiet appearance; the only feature being in Gaslight ordinary, in which business was done up to 113¾; but quotations were unaltered. Crystal Palace ordinary rose 2. Tuesday was also a very quiet day; only a little business being done for the new account in Imperial Continental at 227½. Gaslight ordinary and preference fell 1. Wednesday was likewise a quiet day; the only alteration being a rise of 1 in Melbourne debentures. On Thursday, Continental Union were offered and fell 10 points on the report, and Monte Video also gave way ½. In Water stocks, Lambeth 10 per cent. rose 3. Friday was a very quiet day; the only feature being a further fall of 5 in Continental Union, although no business was officially recorded. Crystal Palace further advanced 1.

ELECTRIC LIGHTING MEMORANDA.

The Troubles of the City of London Company—A Corporation Committee Report—The Problem before the Board of Trade—A Blunder on the Part of the Company.

It would be matter for regret if the troubles of the City of London Electric Lighting Company were to eventuate in such a manner as to encourage the reactionary idea that competition for business is the only way to ensure good working and fair dealing by a public supply undertaking. It cannot be denied that recent developments are in this direction. The history of the dealings of the Corporation of the City of London with the gas supply and other similar concerns of a municipal authority shows that the strong commercial instinct of a mercantile community has always tinged these transactions with the hue of competition. In other words, it has been difficult for the Corporation to realize the economic truth that there are certain business undertakings to which ordinary commercial competition cannot be properly applied. Thus in the old days of gas agitations, it was always to competition rather than regulation that the Corporation looked for the protection of the consumers' interest. History threatens to repeat itself in regard to the electric lighting of the City. The City Company having deeply offended the Corporation, in ways that need not be stated again, and certain outlying Companies being desirous of entering the City with the object of doing a competing business in electricity supply, the situation created has become more interesting and problematical with every passing week. The latest movement in this tangled affair was the holding of a special meeting of the Court of Common Council yesterday week, to consider a report from the Streets Committee relative to the recent conference between the Committee and the Directors of the City of London Company.

At this meeting the Committee formulated three points upon which it was desired to have the views of the Company. These were: (1) The price of electricity; (2) the lighting of the minor streets; (3) the question of purchase of the undertaking by the Corporation. The replies received from the Company were: As to (1), that the Directors cannot see their way to further reduce the price of current at present, but mean to do so as and when the working results of the undertaking permit; (2) that the Company are prepared to surrender the contract right of lighting the minor streets, on condition of receiving the first offer of the work if it is ever undertaken; (3) that the Company will sell their property on terms yielding a very handsome profit to the Corporation, calculating that the purchase-money can be raised at 2½ per cent. The Committee seemed to think that the Corporation have the whip-hand of the Company, in the reported irregularity of the contracts under which the latter light the streets of the City; but they magnanimously informed the

Directors that there was no intention to take advantage of the circumstance, provided the Company could satisfy their private consumers. Further correspondence followed; and so lately as the 24th ult. the Company wrote that the question of price had again been considered; and if the Corporation would facilitate the proposed extension of the Company's continuous-current system, the maximum price would be reduced to 6d. per unit as from Jan. 1 next. All this story is given in the report of the Streets Committee which the Corporation adopted yesterday week; but there the matter ended for the time. Sir Courtenay Boyle has asked for the final views of the Corporation on the general subject of the electric lighting of the city as on Friday last; but the tenour of the reply sent to the Secretary of the Board of Trade has not transpired. Probably it only conveyed the intimation that, while the Corporation had been advised that the public lighting contracts with the City Company are null and void, there is no desire to unduly magnify the circumstance.

This reserve on the part of the Corporation will throw upon the Board of Trade the responsibility of deciding, in the first place, whether there shall or shall not be further competition for the electric lighting of the City of London. Of course, Parliament will have to say the last word on the subject; but the decision of the Board of Trade, arrived at after a special inquiry conducted by the Permanent Secretary in person, will naturally have great weight with the Legislature. As we have already remarked, the situation is full of difficulty; and it will be far easier to arrive at a blundering solution of the problem than the best one in all the circumstances. It is an augury of a peaceful outcome of the controversy that the cooler heads in the Common Council are not disposed to set much store by the alleged illegality of the public lighting contracts. After all is said on this score, the fact remains that the Commissioners of Sewers, who made the contracts, secured an uncommonly good bargain for the ratepayers. Mr. A. C. Morton and the other irreconcilables who will not hear anything to the advantage of the City Company, must recognize that the much-abused undertaking gets a lower price for the street arc lamps than the St. Pancras Vestry charges itself. The prices are, respectively, £26 and £30 6s. 5d. The year before, the Vestry paid itself £38 4s. per lamp. This is municipalization. What an uproar there would have been if the figures were reversed! Besides, the City lighting is looked after by the Engineer's department, and all defects are recorded and charged against the Company. Progressive Municipalism saves the cost of this sort of inspection.

On the other hand, it is asserted, without much justification in fact, that the charge to private consumers in the City by the Company is excessively high. To this complaint it can be answered that the Company have only just managed to earn their 6 per cent. dividend at the Brighton sale differential charge of 7d. and 4d. per unit. In Brighton itself, the price is 7d. for the first hour; and this, in the special conditions of City lighting, would catch the bulk of the consumption for ten months out of the twelve. There is, practically, no late lighting in the square mile of the City of London, excepting a few "balancing nights" and foreign post nights. Indeed, we believe the adoption of the Brighton system by the City Company to have been a blunder of the first magnitude. It is not in the least suited to their circumstances; and they would have been far better advised to cut their rate down to 6d. all round, with a promise of another penny off as soon as possible. It is not too late to reconsider this point. The Brighton system may answer very well where there is a substantial amount of late lighting to be done. But otherwise it is useless; and the high primary charge sticks in the consumer's gizzard. The analyses of electricity works accounts published in the "Electrician" make this quite clear. Thus at Brighton, although the primary charge is 7d., the average revenue only works out at 3·47d. per unit sold. In the City of London, with the same primary charge, the average receipt is 5·918d. per unit. Hence the rebate does not benefit the City consumer in any appreciable degree. It is a point of great engineering interest that the City Company are developing a continuous-current distribution system, in substitution for their old alternating-current transformer system. This is a curious commentary upon the confident prediction of some electrical experts that the continuous-current system is becoming obsolete.

A VIEW OF ILLUMINATING GAS STATISTICS.

Correspondents have again drawn our attention to the article in the March number of the "Journal of Finance," with the title "Illuminating Gas Statistics," which was commented upon in the issue of the "Journal" for the 14th of that month. It appears that certain statements made by the author of this article, who signs himself Andrew Still, have been lately reproduced in some provincial newspapers. As the phrase goes, they have "gone the round of the Press," and strike some readers as quite fresh. At some risk of appearing to repeat ourselves, therefore, we think it may be worth while to expose once more the errors and misconceptions of this critic of British gas industry. These observations are generally depreciatory of Gas Companies, which circumstance naturally recommends them to the favourable consideration of newspapers circulating in localities where the gas supply has not been "municipalized."

It is hardly necessary to state, after this, that the writer's hostility to Gas Companies has been nursed upon, if it did not proceed from, a hopeless misunderstanding of the gas legislation of the United Kingdom and the position and prospects of the industry. Indeed, Mr. Still confesses at the outset that he experienced a feeling of dismay at the sight of the Gas Undertakings Returns of the Board of Trade, upon which his article is based. It is as though the Editor of the "Journal of Finance" had thrown these formidable and forbidding publications at the head of the unhappy would-be contributor to this periodical, with the order to "do something" with them, whether he knew anything of the subject or not. The result goes to show that the latter was the state of the case. One cannot imagine a non-expert, albeit gifted with a turn for statistics, presented with a stiffer job than the task of making "copy" out of the Gas Undertakings Returns. Mr. Still expostulates against the absence from the returns of any indication of the object they are intended to serve; and we are inclined to sympathize with the complaint. We have witnessed the issue of these annual official publications from the commencement, and yet know no more than Mr. Still does what was the specific purpose of the Department, if any, in getting an Order of the House for the returns. This is no reason, however, for an uninstructed magazine writer's mishandling of the subject, as Mr. Still does, and muddling up statistical data, preconceived ideas, and false deductions into a perfectly inane article. Such as they are, the Board of Trade Returns are valuable records for those who know how to use them to good effect; but this power does not come to everybody, even after the devotion of "a month or two's leisure to analyze them," which is Mr. Still's notion of what is required in this respect. It takes more than this for the most interested amateur to acquire anything like facility in the use of the professional man's instruments.

Mr. Still, being left to make the best he could out of the unattractive material in question, bethought himself of the existence of a certain legislative settlement of the gas business of the country. This might throw some light upon the subject! Accordingly, he remarks that "Parliament, after a long and tedious agitation, got worried into enacting a piece of very useful gas legislation; and it was apparently so self-satisfied with the achievement that it has gone to sleep over the question ever since." This was the sliding-scale system, which is characterized as "undoubtedly a most desirable and important reform," but not a "final solution of the problem." It is remarked that "it would have been well if the progress of events in relation to it had been followed more closely by the Legislature;" from which observation it is to be inferred that the critic has not closely followed the dealings of Committees with Gas Bills during recent sessions. He thinks it possible, however, that Parliament has not regarded this phase of the question as of so much importance "since the introduction of the electric light, and, more recently, acetylene gas." In his judgment, "these are bound in time to become very dangerous rivals to coal gas for lighting purposes, and will ultimately supersede it entirely." So that is settled.

This desirable result, it has to be admitted, is "yet a long way off." Curiously enough, the testimony of the Board of Trade Returns is all the other way. Mr. Still entertains "no doubt about its ultimate fate;" but meanwhile the consumption of gas is on the increase, which is a funny way to arrive at desuetude. Consequently, he is fain to declare that "gas manufacture is not by any means a decaying industry yet." It must be very comforting to be able to hold a faith so unsupported by statistical evidence. The writer repeats the popular belief that it is the competition of the electric light which has "put gas engineers on their mettle," and has instigated them to make the "great advances" of recent years in the methods of burning gas for lighting purposes. Coincidences are always puzzling things. But our critic does not like the Welsbach burner, although it is "nearly as great an advance on the common burner as gas was on the old smelly oil-lamp and tallow candle." He describes it as "quite as dirty as the open burner, more destructive of a wholesome atmosphere, and the mantles are at best an unmitigated nuisance with their extreme fragility and liability to get out of order." This is bad.

The Welsbach burner will not save gas lighting for long. The industry will have to depend more and more on the extended use of gas for cooking and heating; and Parliament will be asked to sanction a reduction of the statutory illuminating power prescribed in most of the Companies' Acts. This will afford an opportunity for resettling the whole system; and Mr. Still wisely opines that members of Parliament should set themselves to understand the position, and not make such mistakes as they did "when the question of gas supply was last before them." When was this? Again, it is remarked that "the sliding-scales then fixed may have been reasonable enough at the time; but they have already become hopelessly antiquated, and ought to have been revised years ago. . . : It would, for instance, be a very simple matter to make the standard for sliding-scales adjust itself automatically to changed conditions of production." It is very obvious, from this farrago, that Mr. Still needs instruction in the system of the sliding-scale as applied to the regulation of gas prices, before he can teach Members of Parliament the rights of it. His confusion of the singular and plural numbers in the quoted passages "gives him away." One would imagine from these remarks that Parliament, acting as a whole

fixed all Gas Companies' sliding-scales at once, years ago. He does not appear to suspect that every Gas Company has its sliding-scale adjusted to its own requirements, nor that this is done every year, as the non-sliding-scale Companies come to Parliament. What is meant, also, by the assertion that it would be a very simple matter for the standard for the "sliding-scales"—in the plural or the singular—to "adjust itself?" One would like to have this point cleared up. We must evidently explain the sliding-scale principle in greater detail than was considered necessary on the former occasion.

It is stated that the sliding-scales at present in force were fixed "when the cost of production was very much higher actually as well as relatively." This, of course, is only nonsense. Certain Gas Companies have at different times secured the very questionable boon of too high a standard price; but it is certainly not true, generally speaking, that since the principle was first introduced the value of residuals has risen, or the price of coals fallen, or freights been lowered, or any other material alteration been realized in gas manufacturing costs. It is extension of business, and nothing else—growth of gas consumption, enormous, unexpected, that has made the standard prices of some Gas Companies unnecessarily high. Mr. Still admits that "in theory the sliding-scale arrangement is the best that could be devised for protecting the public;" but he immediately betrays his ignorance of the working of the arrangement. He states that "the principle of the system is that for every reduction in the price of gas below a certain point the Company will be allowed to pay a higher dividend; and consequently it is to the interest of Companies to reduce the price as much as possible." So far, good; but, the mentor goes on to say: "In practice the object is not attained, or even approached." Why? Because, "suppose the sliding-scale commences at 4s. per 1000 cubic feet, the Company may attain the maximum dividend which it is allowed to distribute on the basis of 3s. 4d.; and *it has no inducement to reduce the price below that figure*, although it could probably sell gas at 2s. 6d., and still have a handsome profit." The italics are ours. Nobody who knows what the sliding-scale is will be able to make head or tail of this egregious statement. For the sake of those who do not know, however, it may here be explained that for every penny of reduction from the stated standard price of 4s., the Gas Company would be able to pay ¼ per cent. more dividend. There is no limitation of the range of the scale, up or down. Selling gas at 2s. 6d., such a Company would be authorized to pay 4¼ per cent. extra dividend; and the inducement would be operative were the price to fall to 2s. per 1000 cubic feet, when the lucky Company might divide 6 per cent. extra dividend. Mr. Still is utterly in the dark in this regard; and consequently his vapid sneer at the arrangement by which, as he imagines, a sliding-scale Company can make their customers "pay from 30 to 40 per cent. more than the market value of the article in order to maintain a lot of highly-paid unnecessary sinecures," is thrown away.

Going away from the sliding-scale, Mr. Still finds in the returns "pretty conclusive proofs of the benefits of placing such undertakings as gas supply in the hands of Local Authorities;" but it is to be feared that his competence as a collector of evidence is not impeccable. He pillories a number of small Companies for the sin of charging more than 4s. per 1000 cubic feet for gas, and opines that many of the places served in this way would be "an exceptionally promising field for the exploitation of acetylene gas." Doubtless, if, as he artlessly remarks, this illuminant "can be produced (even at the present high price of calcium carbide) at 2s. 6d. or less for 1000 cubic feet, it would be a great boon in places where the charge for coal gas is 5s. or 6s." Seeing that the only public acetylene lighting undertaking that ever went into this business had to charge about £5 per 1000 cubic feet for the luxury, the supposition here formulated seems rather wide of the mark. Lastly, this writer finds another stone to throw at Gas Companies in the quantity of gas consumed by the public lamps supplied by them. He notes that the average consumption per street-lamp supplied by Local Authorities in 1897 was 15,240 cubic feet. The average for all the Companies was 17,450 cubic feet, and for The Gaslight and Coke Company 20,430 cubic feet. Upon these figures, his remark that "the gluttony of those Companies' lamps compared with the consumption which the Local Authorities find sufficient is certainly significant." It is; but of what, it would be a vain endeavour to try and express in a paragraph, for the edification of Mr. Still and his congeners. Suffice it to say that there is a good deal more in these figures than meets the non-professional eye. When it comes to complimenting the Scottish Local Authorities on the superior excellence of their public lighting arrangements, it begins to look as if the amateur of the Board of Trade returns had indeed got hold of some queer twist of logic. Nevertheless, taken with the right amount of "salt," the article is to be welcomed as a grudging testimonial to the importance and vitality of the gas industry of the United Kingdom.

Coal near Calais.—A discovery of coal in the Pas de Calais, to which much importance is attached by geologists as bearing upon the coal seams pierced in Kent, is announced. The boring is a few miles south-east of the town, and is one of several which have been put down, under the direction of M. Breton, the French geologist. The seam struck is 2 ft. 6 in. thick, and is pronounced equal to the best quality of steam or Welsh coal.

UP-TO-DATE GAS LIGHTING AT THE CRYSTAL PALACE.

For several years past gas engineers have had to concede the supremacy of the electric arc lamp for the lighting of extensive interiors and open spaces; but such a concession, as has been shown in the "Journal" on more than one occasion of late, is now a thing of the past—thanks to the development of the "intensified" gas system. To the examples of this order of lighting which have already been noticed in these columns a new one has to be added; and we have pleasure in calling attention to it, because it can nightly be judged with electric arc lighting under circumstances which are conspicuously and equally favourable to securing the best performance with both methods of lighting. It is at the Crystal Palace that this new installation has been made; and, without any desire to advertise a particular system, but with the best interests of the industry at heart, we can unhesitatingly recommend gas engineers who may be in town during the next fortnight to pay an evening visit to that centre of pleasure and see the lights for themselves.

So far as we can remember, gas has never had fair play in the lighting of this beautiful structure. For many years the only means of illumination was a single line of a cheap type of gas-burner close to the roof, with additional rows of jets in the neighbourhood of the orchestra. Then the electric light was introduced; and the change for a time was regarded as a welcome one by frequenters of the Palace. But they soon discovered the weaknesses of the light, though the Directors seem to have been blind to them. Perhaps the old Directors were never subjected, for example, to the discomfiture caused by sitting in an elevated position at a concert or entertainment in direct line with a restless arc lamp; and if the new ones have not been, they should try the effect upon themselves, and then see if they cannot do something to alleviate the sufferings of their patrons in this respect. While the electric light has held sway in the main parts of the edifice, gas has been performing the humbler duties of lighting the annexes and corridors, and supplying the means for decorative illumination. Now the Directors and the public have an opportunity of judging fairly what can be done by gas in comparison with the electric light; and the change has been brought about in this way: Upon seeing the installation of intensified gas lighting at the Marylebone Terminus of the Great Central Railway, Mr. George Livesey was so impressed with it that on his suggestion steps were taken to obtain, on behalf of the Crystal Palace District Gas Company of which he is the Chairman, the permission of the Directors of the Crystal Palace to a trial of the system there. The necessary consent was secured; and instructions were at once given to Messrs. W. Sugg and Co. to proceed with the work, on similar lines to those followed by them at the Great Central Station. In one respect the Gas Company are unfortunate in having to content themselves with the side walks and extreme end of the North Nave; the central portion being still occupied by the electric arc lamps. In another respect, however, it is fortunate, as it affords an unrivalled means of making a comparison of the two lights.

The methods which Messrs. Sugg and Co. have adopted in carrying out this high-power system of gas lighting have been so recently described in the "Journal" (p. 969), that it is unnecessary to again refer to them in detail. In the present case, the installation consists of 24 lamps, fixed about 15 feet above the floor-level. The lanterns are of the "Taj" pattern, containing clusters of three of Mr. Sugg's burners, which have been specially designed for dealing with the high pressure required by the system. The burners (which are of course surmounted by Welsbach mantles) are regulated to burn 10 cubic feet of gas per hour each, or 30 cubic feet per lamp; and each lamp gives the magnificent duty of 1000 candles. The Crystal Palace stands at a high elevation, and consequently the ordinary evening pressure of the gas is between 3 and 4 inches; but for the purposes of the system, it is raised to a pressure of 9 inches by the means adopted by Mr. Sugg. The pressure-raising plant is quite equal to the service of twice the present number of lamps. The price of gas in the district being 2s. 6d. per 1000 cubic feet, the cost per lamp per 1000 candles works out at rather less than 1d. an hour. The cost of raising the pressure of the gas (which is a moderate item under any ordinary conditions) is in this case almost *nil*, seeing that the Crystal Palace Company have a system of water supply of their own for the fountains and other purposes. This should certainly serve as a good argument in favour of an extension of the system in the Palace; and the insignificance and cheapness of the whole of the plant required when compared with the ponderous and expensive machinery in use for electric lighting in the building cannot surely fail to have weight with the new go-ahead Directors.

The electric lights down the centre of the nave are supposed to be of 1000-candle power; but any conscientious electrician would blush to hear them so described with such contradictory evidence running side by side. Taking a perspective view, and contrasting the two forms of lighting, the points which will strike the observer in favour of the gas-lights are their brilliance, steadiness, beautiful tone, and wonderful diffusive power without shadows of any kind. It is really something to marvel at, that such great results are produced by such small means; while in the case of the neighbouring electric lights, such comparatively small results require such a tremendous amount of

costly power. Another point which will be noticed about these gas-lights is this, that they can be looked at quite steadily without any hurtful effect on the eyes; and this is due to the fact that they contain no actinic rays, as is proved by the failure of Mr. Sugg to obtain photographs by them. The whole of the work was carried out by Messrs. William Sugg and Co., under the supervision of Mr. S. Y. Shoubridge, the Engineer of the Crystal Palace District Gas Company, to whom the writer was indebted for courteous attention and information on a recent visit to the Palace to view the installation.

It may be added that the Crystal Palace Company have adopted a large scheme of decorative illumination by means of gas. The North Tower Gardens at the present time are finely decorated at night time by coloured glasses containing small gas-jets. It is now intended to extend the system to the two upper terraces (which are each about ¼ mile long); and we understand that about 100,000 lamps will be required. The necessary pipes are being laid; and the Gas Company are making their arrangements to meet the enlarged supply for this purpose. We doubt if anything of the kind has ever before been attempted on such a magnificent scale in this country; certainly, when completed, the grounds at night time will present a grand and beautiful appearance.

WORKMEN'S BENEFIT SOCIETIES.

[Third Article.]

Compulsory Membership.

Having indicated some reasons which may be held to justify an employer in preferring that his men should belong to a Society connected with their employment, we have now to consider the arguments adduced in favour of his being permitted, under certain previously specified conditions, to make membership thereof a condition of employment. The Committee report that the witnesses representing Shop Clubs stated that, in their opinion, it is desirable that the employer should have this right, for the following reasons:—

(*a*) However favourable to the workmen the scheme of a Shop Club might be, there would generally be some who, through thriftlessness, negligence, or obstinacy, would fail to avail themselves of it.

(*b*) Where all the workmen do not join the Shop Club, the purpose of preventing vexatious casual appeals both to employer and fellow-workman for assistance . . . would be defeated.

(*c*) It is conducive to the stability of the Club that its risks be distributed over as large an area as possible—that is, over the whole number of workmen employed.

(*d*) The circumstance that the Club applies to the whole body of workmen, would enable the members to secure the greatest amount of benefit at the cheapest rate.

(*e*) A large majority of the workmen in the employment, including as a rule the most careful and thoughtful men, being in favour of the Club extending over the whole body, their view ought to prevail over the minority.

Whilst not disputing the truth of any of these statements, we must say that, as arguments in support of compulsion, none of them except the first strikes us as particularly convincing. It is, of course, only natural that, if a man has insured his life in an Insurance Office, he should be desirous that as many other people as possible should be induced to effect policies with that particular office, as he would then feel more certain of the security of his own policy; but the benefit to him would be of itself no argument in favour of compelling some unwilling or careless person to so insure his life. Much may be said in favour of the system under which the German working classes are forced to make provision against sickness or old age; but surely no one would defend the compulsory character of that insurance on the ground that A being so provided for would benefit his fellow workman B. It must be shown that it is to A's own advantage that he should have no option in the matter; and it seems to us that, before compulsory membership of any club can be justified, it must be satisfactorily demonstrated that such membership would conduce to the interests of the men who would not join unless compelled.

The whole justification for such compulsion then lies in the fact that, but for it, many men would, by neglecting the opportunity for providence, leave themselves and their families without provision for a rainy day. Some will say: Having given them the opportunity, why concern yourself more about them? On this point, we will quote, and endorse, Mr. Holland's reply when asked by the Chairman: "Is it the business of the employer to go beyond making the best practical effort to get his men to be thrifty?" He said: "That is a big question. It is not strictly the business of the employer to do anything more than to pay his labourer as little as possible, and to get out of him as much work as he can; and, if he does more, there are plenty of people who will talk about grandmotherly conduct, and so on. But if he is worth his salt he will do much more, and will try and teach the young fellows to be thrifty, and see they are thrifty in the proper direction." And, we would add, he will be amply repaid for so doing.

Because, therefore, it is undoubtedly for the benefit of the men—and, consequently, to the advantage of their employer—we agree that, under properly defined and regulated conditions, it is just and wise that masters should be allowed to say that they will employ no man unless he join the "Shop Club." With such a finding, however, some of the leading Friendly Societies are by no means pleased, to judge by the comments made thereon at their recent annual conferences; and blame was thrown by one at least of those Societies upon the manner in which their case was argued before the Committee by the witnesses delegated to the task. Abuse of its own representatives is not infrequently the resort of a beaten party. The ground on which the Friendly Societies nominally base their objection to compulsory membership of Shop Clubs as a condition of employment is the infringement of "freedom of contract." The written statement of their case laid before the Committee set forth, and the Presidents at the Conferences now repeat, that compulsory Societies are objectionable because they interfere "with that perfect freedom of contract which should exist between the employer and workman." It is astonishing how many people mistake the repetition of a phrase for the production of an argument. How in this imperfect world can there be "perfect freedom of contract" between a man who seeks employment and the man who has it to give? Until some method can be devised by which rates of wages shall be independent of the law of supply and demand, the parties to such a contract will always be obliged to agree to terms different from those they would prefer, in order either to obtain work or to get work executed, according as the advantage of circumstances lies with man or master. How much "freedom" is there about the bargain struck between a master-painter and his men when "spring-cleaning" is in full swing? The law can only—as by the Truck Acts—step in to void contracts involving an established breach of equity; and against the possibility of such a breach in the case of compulsory membership of Shop Clubs being made a clause in the terms of employment ample safeguards have been suggested by the Committee. Dislike of the competition of private Benefit Societies with the public Friendly Societies is the true source of the anger of the latter, and our approval of the findings of the Committee is not shaken by such speeches as that made by the Grand Master of the Independent Order of Oddfellows, who, addressing the Annual Committee of the Order at Doncaster, said, in reference to the Departmental Committee's report, that "it would certainly be better that no legislation should be sought on the lines of that report, or their position would be made worse by the enslaving provisions which the Committee had sandwiched between their specious concessions." Adjectives are a poor substitute for arguments.

We further agree with the Committee in holding that it is not advisable that any employer should be permitted to interfere with the right of any man to join as many Provident Societies as his thriftiness prompts, or his means allow him to do.

The Dock Friendly Society.

This brings us, at length, to the examination of the reasons underlying the action of the Dock Authorities in making it obligatory upon their men not only to join the Dock Friendly Society, but to leave every other. This rule, when first brought to public notice, by meetings of protest in the East-end and by comments in the Press, appeared unjust and tyrannical; and there seemed no obvious explanation for such a requirement, other than a desire to unduly bind the men to the service of the Docks. We, however, felt sure that all the facts of the case were not then known, and accordingly reserved judgment. The evidence given by Mr. Holland puts, as we expected, a somewhat different complexion upon his Committee's action; for it appears that the Docks, as distinguished from almost every other firm of employers, allow their permanent staff (comprising some 4500 men, who alone are *compelled* to join their Society) half-pay when sick. The wages of men on the permanent staff vary from 24s. to 50s. per week, and the allowance made by the Society from 7s. to 20s. per week; so that, when sick, a permanent hand receives, in wages and in Club allowance combined, nearly as much per week as if he were at work. The consideration, then, that led the Docks Committee to enact that no member of their Society should belong to any other, was the fear that, should a man when on the sick-list be actually in receipt of more money than if he were at work, there would be a strong inducement to him to indulge in unduly prolonged convalescence, with the result that the employer would be paying a man capable of work half wages for doing none.

This, as the Cardinal is reported to have said to Count Herbert Bismarck, when the latter proclaimed his identity in order to justify an attempted intrusion upon the Pope, is an explanation, but not an excuse; for it leaves out of count altogether the possibility of the discontinuance at some future date—on the ground of bad trade or through a breach of friendly relations between the Committee and their employees—of the allowance of half wages to sick men. Many of those men would then be unable, through old age, to make provision—through the agency of outside Societies—for maintaining their incomes at a figure which would keep them and their families from want should they be temporarily disabled from work. Such a regulation as the one enforced by the London and India Docks does,

therefore, spite of Mr. Holland's perfectly sincere disclaimer of such intention, have the effect of unduly binding the men to the service of the Docks. That the present management consider the welfare of their men, and are anxious to deal fairly with them, is no more an argument in favour of their being permitted to enforce conditions which would be more obviously, but not in fact more actually, unfair if imposed by an unjust employer, than is the personal character of any individual sovereign a valid argument in favour of despotic government. The famous Madame de Staël once sought to flatter the then Emperor of Russia by saying that his character was a constitution for his country, and his conscience its guarantee. His reply, as true as it was witty, was: "*Quand cela serait, je ne serais jamais qu'un accident heureux.*" Mr. Sydney Holland, as Deputy-Chairman of the Docks Committee, is but a "happy accident."

We are therefore of opinion that, to avoid giving just cause for the enemy to blaspheme, the Dock Authorities would be well advised—if the suggestions of the Committee are adopted by Parliament they will, indeed, be compelled—to rescind the rule prohibiting members of their Society from belonging to any other. If in consequence, as Mr. Holland declares would be the case, they felt obliged to withdraw their grant of half pay to men on the sick-list, they might, in order not to treat their men less favourably than before, increase the contribution to their Friendly Society by the estimated amount of the wages saved, and thereby enable the rates of subscriptions to that Society to be reduced. Their men would then have the means, as well as the liberty, to make further provision against sickness by the aid of outside Societies.

We may add that we do not quite see how this rule of the Dock Society is enforced—that is to say how the managers of the Society satisfy themselves that the members do not belong to any other Society. Surely a man who is capable of attempting to malinger is capable of making a false declaration, and the Dock authorities are therefore not improbably incurring the odium attached to, without deriving the supposed advantage from, the condition they seek to impose.

Malingering.

As we have said, the reason adduced by Mr. Holland for the enforcement of the rule to which objection has been taken, was the fear of imposition by malingerers; and the Committee, in commenting on his evidence, remark that malingering is "a practice which appears to be acknowledged as a cause of great difficulty and loss in connection with Friendly Societies." This may be so as far as the large public Friendly Societies are concerned, although we do not think the Committee were justified in drawing so wide an inference from the evidence before them; especially bearing in mind the exceptional terms of employment of the Dock hands, and the fact that those labourers are drawn from the lower grades of workmen—circumstances which doubtless justify Mr. Holland in holding that, in the particular case of his Society, "malingering is a real risk," but which should prevent any general conclusion being founded on his evidence alone. But, as far as employers' Clubs generally are concerned, we have no hesitation in saying that if an employer have good cause to believe that malingering is to any appreciable extent prevalent or possible among the members of his Society, he has equal cause to believe that either the rules of the Society are faulty or the management is lax as regards their enforcement.

This question of malingering is frequently raised, and is one that will repay investigation; and, if examined in the light of experience and of reason unobscured by the products of a "boiling imagination," it will, we think, be found to be somewhat in the nature of a "bogey"—the fear being frequently the father to the thought.

We believe it to be the fact, proved by actual experience, that the men who are most often the objects of suspicion in this respect—namely, those who are members of more than one Benefit Society—are, if those Societies be efficiently managed, of all men the least likely to be guilty of malingering. The man who is sufficiently thrifty and provident to subscribe to several such Clubs is too honest and respectable a man to defraud them, even if he were able. We say "if those Societies be efficiently managed" because, of course, should Societies obtain the reputation of being easy-going and lax in their supervision of sick members, they will soon add disreputable members to their roll. But if proper visitation and medical supervision of the recipients of sick allowances be adopted, he is a clever man who can unduly drag out his convalescence; and the more Societies a man joins the greater the amount of scrutiny to which he is subjected.

We have known of cases where men have belonged for twenty years to two, and even three, Societies without once declaring on the funds of any of them. The man who, if he belong to a Club, is most likely to malinger is the skunk who likes to lie in bed or loaf about while his wife works. But he is little likely to join any Society unless compelled; and an employer with a good reputation will rarely have room for such a man on his pay-sheets.

In support of our opinion, we give the following extract from the evidence tendered by the representative of Messrs. Spottiswoode and Co.:—

Q. 407.—You do not object to their belonging to any other Society? A.—Not in the least, for the simple reason that if they belong to one or two other Societies they are not so likely to call upon their fellows in case of a long illness.

Q. 408.—You do not think there is any real mischief in their having these large benefits in sickness? A.—Not the slightest. I have over 300 men under my control; and I find that those who belong to one or two other Societies are the best men.

In employments where the conditions of service are such that good workmen are attracted thereto, experience goes to show that, so far from malingering being (except in rare cases) attempted, the men as a whole err rather on the side of returning to work before they are really fit. This, of course, is most frequently observed in the case of men who, having only one Club to provide for them, feel the pinch of a reduced income. But the desire to return to work at the earliest possible moment is not always or entirely due to financial straits; for we believe that most employers who, in the right way and the right spirit, do their best for their men, will bear testimony to the willingness of the great majority of those men to render honest service in return. This honourable devotion to duty is most marked in the most thrifty men.

The imaginary danger of "malingering" so haunts the minds and warps the judgment of some managers of Workmen's Clubs, that we would speak a word of warning against their making a practice of always using every means to urge sick members to return to work, regardless of the individuality and character of the members. That is often a policy of "penny-wise, pound foolish;" for men not infrequently need to be restrained, not only for their own good, but in the interests of the Society to which they belong, from returning to work before really well enough to do so without risk. We doubt not that the eventual loss to a Society by the consequent (in some cases permanent) injury to the men's health, is far more serious than another week's sick pay would have been. The hardship entailed by a reduced income, which, as we have pointed out, is a strong inducement to a premature return to work, is removed when a man belongs to two or three Clubs; and such multiplied memberships are, therefore, from that point of view, to be encouraged. As bearing on this side of the question, we would say that we are of opinion that money spent in obtaining letters of recommendation for convalescent homes is well invested—provided, of course, that the letters are judiciously, and not indiscriminately, allotted. A fortnight spent in sea or country air, with good food provided and regular habits enjoined, instead of in attempting to perform tasks beyond imperfectly restored strength, will often save a constitution from premature collapse, will reduce the liability to future illness, and postpone perhaps for years the funeral claim.

In bringing to a close these somewhat discursive comments, we would again urge upon employers generally the importance of making certain, by careful consideration and inquiry, that the rules of any Clubs officially connected with their works are calculated to promote a spirit of loyalty and confidence among their men—a spirit the absence or presence of which is not always obvious to superficial observation, but has an incalculable effect upon that most important item in the accounts, the amount available for dividend.

PERSONAL.

Mr. R. M. Couper, late of Newbury, has been appointed Secretary and Manager of the Wells (Somerset) Gas Company, in succession to Mr. C. V. Bennett, who has been appointed Manager at Felixstowe.

Changes may be expected to take place shortly in the management of the East Dereham and Witham Gas-Works; Mr. A. Drage at the former, and Mr. R. Robinson at the latter, having tendered their resignations.

Mr. W. J. Moore, chief of the Street Lighting Department of the Welsbach Incandescent Gas-Light Company, Limited, is leaving that Company for the purpose of taking up similar duties with the New Sunlight Incandescent Company, Limited, where he is to be entrusted with the organizing of a very complete department.

The Directors of the Airdrie Gas Company, out of a list of about 30 applicants, have appointed Mr. Alexander Smith, of Birmingham, Manager of their gas-works in room of Mr. T. Turner, resigned. Mr. Smith is a son of the Manager of the Aberdeen Corporation Gas-Works. In that city he received his education, and served a full apprenticeship to the engineering trade, after which he entered on his special training for the chosen work of his life. He had for some years the advantages of practical instruction under his father in all the duties pertaining to gas manufacture in the works and also in the drawing office. Leaving Aberdeen some six years ago, with a view to enlarge his experience, he went to Glasgow, and was employed in the Dawsholm Gas-works. The excellence of his work there soon attracted the attention of Mr. Foulis, and he was transferred to the head office. He has been for some months past an assistant in the Birmingham Corporation Gas-Works. He is a young man in his prime, and will doubtless be of much assistance to the Directors in the carrying out of necessary extensions which they will have to face in the near future to keep abreast of the present and prospective large increase in the population of Airdrie.

NOTES.

Paint for Floors and Damp Walls.

It is suggested in the "Ironmonger" that engine-house floors, and other floors in general as to the treatment of which some difficulty is experienced, might be painted. Some shipowners are now adopting this means of treating ships' decks. Iron decks readily lend themselves to being painted; and it must be infinitely cheaper than the perpetual cleaning of wooden decks. The paint, however, needs to be specially prepared, or it will scratch, crack, and perish. A recipe for making a good floor paint is as follows: Grind 56 lbs. of dry ochre and 10 lbs. of litharge in 1 gallon of the best Baltic linseed oil, to which is added 2¼ gallons of turpentine. When using, a moderate quantity of driers can also be added. This is said to make a pretty buff paint, which will prove both hard and elastic. If it answers for ship's decks, it ought to answer for many other situations where the wear and tear and dirt are less. Our contemporary also mentions, with guarded approval, a new proprietary covering compound marketed under the name of "Sternocarbol." The preparation is put forward as being remarkably effective as a covering material, one coat of it being equal in this respect to two coats of ordinary paint. It will stand well on damp walls, and is cheap. The number of new preparations in the paint and distemper line is great, and some of these are distinct improvements upon the older coverings.

Gas-Pipes in the Soil.

At a recent meeting of the Architectural Association, Dr. G. Vivian Poore read an interesting paper on "Aspect and Soil in Relation to the Dwelling House." The author dwelt stringently, as a physician and sanitarian, on the conditions under which modern suburban building estates are laid out. He was also very strong in condemning the improved artisans' buildings favoured by local authorities "with concrete foundations, damp-proof walls, patent water-closets and traps, sewer-pipes, and rain-water pipes, with an expensive paving in front, and a tiny concreted yard behind, which is practically an air well with putrefication traps in its floor." Criticizing the usual requirement of a bed of concrete to cover the basement area of a town building, Dr. Poore remarked that this is a reasonable regulation for a populous place, but the smallest crack or pinhole destroys the efficacy of the coating. He said: "In London we know that when the soil is opened up there is always a stink of illuminating gas, and, obviously, it is desirable to keep that out of our dwellings." Mr. G. H. Fellowes Prynne, the President of the Association, improved upon Dr. Poore's indictment of gas distribution in towns by stating that "faulty pipes were one of the greatest evils which we in London have to deal with. One could go into house after house and find faulty pipes under floors or in bedrooms; people did not get absolutely ill, but there was a sort of lassitude about them, and they could not tell why. It was simply and solely due to the escape of this impure gas—not sewer gas, but simply illuminating gas." Remarks were also made upon the effect of town pavements in keeping down the earth gases, which consequently often got into the houses instead of escaping freely into the air. We cite this paper and discussion here, because the pollution of subsoil by gas-pipes is a matter that does not attract the attention it deserves from members of the gas engineering profession.

The Improvement of Portland Cement by Trass.

The occasional failure of Portland cement concrete in sea water has engaged the attention of some eminent chemists, and notably of Dr. Wilhelm Michaëlis, of Berlin. As the result of many years' experimenting, Dr. Michaëlis finds the cause of this trouble in the quicklime of Portland cement. Where this constituent exists, and can be reached by sea water, the disintegration of the strongest Portland cement into mere mud is inevitable. Inasmuch as the strength of cement is largely due to the lime it contains, it would almost seem to follow that a strong and at the same time sea-water resisting Portland cement is almost a contradiction. Dr. Michaëlis is quite persuaded that unless something is added to hydraulic mortars rich in lime for the latter ingredient to unite with and form a saturated compound, sea water will destroy it. The action of the sea water is purely chemical. The best material for adding to Portland cement in order to prevent this chemical action of sea water upon the mortar or the concrete is powdered volcanic tuffstone, or "trass," of which enormous deposits exist near Andernach, on the Rhine. It is quarried, and shipped from Rotterdam. The material has many of the characteristics of the Italian puzzolana, with which Smeaton built the Eddystone lighthouse. This comparatively new article of commerce was brought forward at the recent Building Trades Exhibition. It is largely used in the more modern Baltic and North Sea harbour works. An equal weight of trass is added to cement, and then the sand, or sand and concrete mass is also added in the usual way. The resultant composition is not so strong up to a 28 days' test as a similar mixture in which the trass is replaced by more cement; but after this period, the strength of the cement and trass mortar continues to increase. This is the solution of the difficulty of rendering cement concrete impervious by sea water which commends itself to Dr. Michaëlis. Of course, it makes the cement go much further; but the point is that the admixture of the trass is a positive advantage and safeguard, as well as a saving in cost.

A Peculiar Well.

In a lecture recently delivered to the students of the University of Wisconsin, by Mr. Onward Bates, he related, in an interesting manner, the history of a peculiar well; and we reproduce from the "Engineering Record" the following particulars in regard thereto. The well was sunk in Dubuque to obtain a supply for the ordinary uses and fire protection of large railway shops in the city. The information obtainable from the logs of other wells in the neighbourhood enabled the superintendent to determine about how deep he would find water. From this investigation, the well was bored to a depth of 1263 feet, and two supplies of water were encountered, approximately 800 and 1200 feet from the surface. Sufficient water could be obtained from the 800-feet level; but it would require to be pumped. The water from the 1200-feet level would give a head sufficient to supply the ordinary purposes of the shops without pumping; but it was deemed insufficient for fire protection. He could not get the supply from the 800 and 1200 feet levels jointly without losing the pressure from the lower level, because it would naturally equalize itself with that of the 800-feet level. Therefore the superintendent solved the problem by putting down first an 8-inch pipe to the rock, which was about 150 feet from the surface. This pipe was merely a casing for the protection of the inner pipes, enabling them to be put in or taken out at pleasure, and also for keeping out the surface water. Inside this 8-inch casing was sunk a 6-inch pipe, which was packed in the top of the rock. Then a 4-inch pipe was placed inside a 6-inch pipe, the bottom of which rested upon a shoulder left in the hole, and was packed against the shoulder at a depth of 1100 feet from the surface. At the top of the well, the 6-inch and 4-inch pipes were so arranged that they could be used jointly or separately. For ordinary purposes, the water brought through the 4-inch pipe from the lower level is delivered into a tank at a height sufficient to give the proper head for distribution throughout the shop. For fire purposes, there is a large pump in the engine-room of the shop, connected with both the 6-inch and 4-inch pipes. When this pump is in use, it draws water from the 1200-feet level through the 4-inch pipe, and from the 800-feet level through the annular space outside the 4-inch and inside the 6-inch pipe—giving an abundant supply.

The Burning of Carbon.

Professor Harold B. Dixon recently dealt with the above subject at a meeting of the Chemical Society. He pointed out that in the combustion of carbon, the formation of carbon dioxide is usually described as being due to a single and direct action between carbon and oxygen. It is stated or implied that carbon monoxide is only formed by a secondary action between carbon dioxide and carbon. The only experiments which claim to prove this are the two series made by Julius Lang, described in the "Zeit. Phys. Chem." for 1888. The author repeated these experiments, and found that when oxygen was passed over carbon heated to 500°—a temperature at which Lang showed that carbon dioxide was not reduced by carbon—even in a very slow stream, some carbon monoxide was always formed. Under conditions far less favourable for the reduction of carbon dioxide than in the experiments cited—viz., by passing a mixture of carbon dioxide with 6 to 8 per cent. of oxygen over carbon heated to 500°—some carbon monoxide was always formed. Lang's more important argument depends on his second series of experiments, which consisted in passing a mixture of oxygen, carbon monoxide, and nitrogen over carbon at 500°. He found that, with a slow stream, the carbon monoxide remained unchanged in amount; while all the oxygen was converted into carbon dioxide. With a quicker stream the proportion of carbon monoxide increased considerably; but with a still quicker one it was much reduced. The author has made many experiments to test these results. When a mixture containing about 80 per cent. of oxygen and 20 per cent of carbon monoxide, was passed quickly over coke heated to 500°, the blue flame of burning carbon monoxide was observed, and the amount of that gas found in the products was small. On lowering the rate of the stream of gas, the flame was not formed; but the carbon glowed, and the amount of carbon monoxide in the products increased. This reached a maximum, and then diminished as the rate of the stream was continually lowered. With a very slow stream, from 2 to 4 per cent. of carbon monoxide was found in the products. These results are quite opposed to the conclusions drawn by Lang—viz., that carbon monoxide is unaltered when mixed with oxygen, if it is passed very slowly over carbon at 500°. His argument that carbon dioxide must be first formed is therefore invalid. The results of the new experiments might be explained on either hypothesis, if it be assumed that the molecule of the monoxide or of the dioxide, as the case may be, formed by the direct union of the elements at 500°, retains sufficient heat (from its heat of formation) to react with oxygen or carbon respectively. In the discussion upon the paper, Professor Clowes remarked that Dr. Haldane had shown that a small proportion of carbon monoxide accompanies carbon dioxide in the products of the spontaneous oxidation of coal at ordinary temperatures. Carbon monoxide was detected by reaction with diluted blood; its proportion being estimated by this colorimetric method, and the result confirmed by the ordinary gasometric method.

TECHNICAL RECORD.

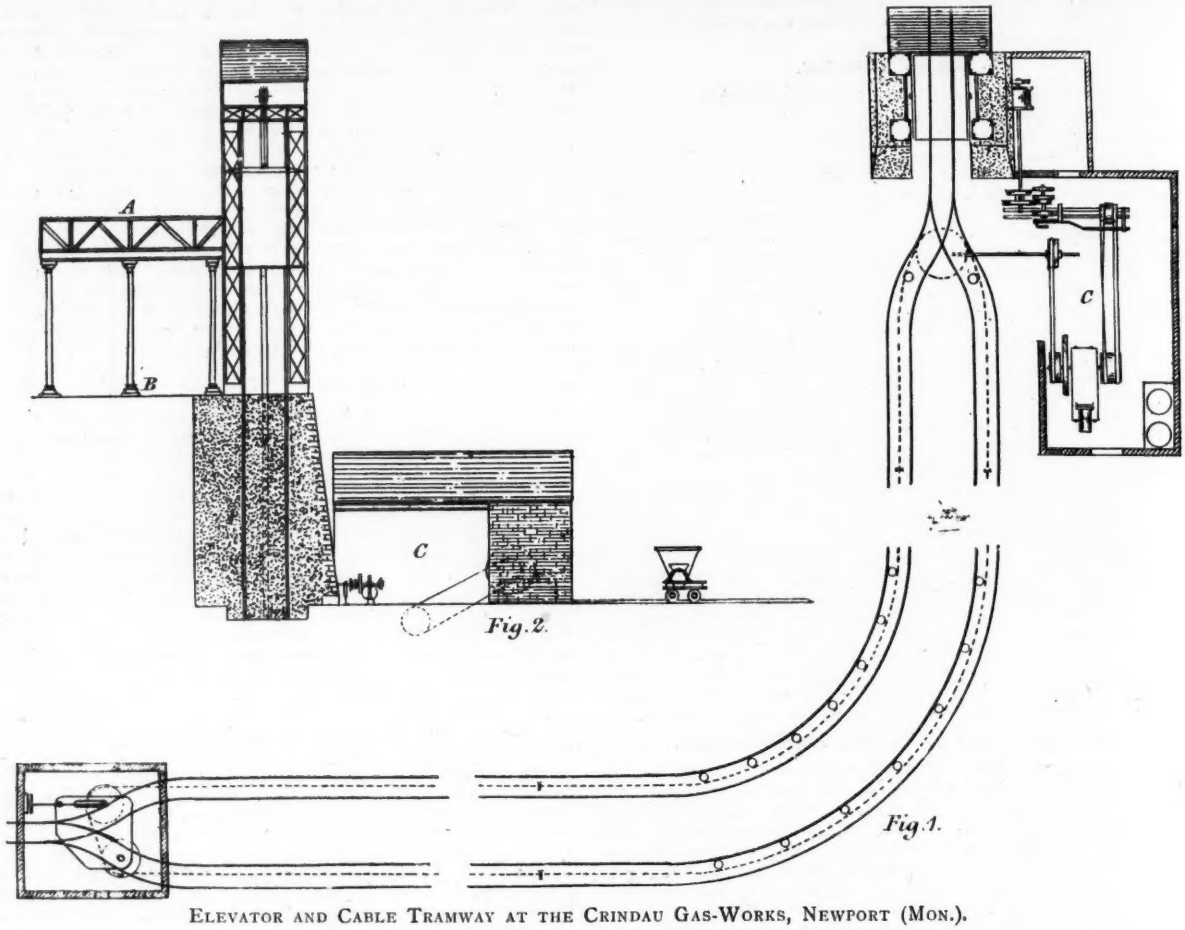
ELEVATOR AND CABLE-TRAMWAY, CRINDAU GAS-WORKS, NEWPORT (MON.).

Recent numbers of the "JOURNAL" have contained much matter descriptive of conveying machinery in operation at, and projected for use in, gas-works; and to-day we give an illustration and particulars of some very useful plant recently erected for the transport of materials at the Crindau works of the Newport (Mon.) Gas Company, to the designs of the Engineer, Mr. Thomas Canning, Assoc.M.Inst.C.E.

The coal-stores of the Crindau Gas-Works run parallel with the main line of the Great Western Railway from Pontypool to Newport; their floor-levels being about 30 feet below the rail-levels. This has afforded great convenience for siding accommodation—giving abundant facility for the delivery of coal. A very large proportion of the coke made at the works is, however, sent away by rail to the shipping, or elsewhere; and consequently it has to be elevated to the requisite height for discharging into waggons. To enable this to be economically and expeditiously done, there was completed at the works and put into action about six months ago an elevator and cable-tramway seen in the accompanying illustration. Fig. 1 is a plan showing the tramlines (double way) running through the coke yard, the tower, and machinery house, C; while fig. 2 shows an elevation of the two latter with a projecting platform A, on to which trams run from the cage.

The trams are made self-tipping, and can be discharged at once into the railway waggons. The system of haulage is by means of an endless rope. The motor employed is a 16-horse power (indicated) Crossley gas-engine, which performs the traction and hoisting, and is adequately geared for both. The hoist is constructed to take 6 tons up to the platform, or to carry down a similar weight, safely and expeditiously. It is not worked to this extent; about 2 tons being as yet the heaviest weight lifted or lowered, except for testing. The cage in the elevator is of exceptional size and strength—not because this was required for coke only, but because the elevator is used for the discharge of bricks, retorts, girders, pipes, &c., or for the lifting of similar or other materials on to the line. These weights are lowered or delivered on to the second platform B; the coke alone going up to the platform A.

The tower, up to the level of the rails is, as shown, constructed in strong masonry; and above that it is continued in lattice wrought-steel standards, of exceptional strength, framed



ELEVATOR AND CABLE TRAMWAY AT THE CRINDAU GAS-WORKS, NEWPORT (MON.).

as shown. The girders, guides, wire-ropes, trams, and rails are all of steel of the best quality. The gauge of the rails is 2 feet. The coke trams are end self-tipping waggons, carrying about 10 cwt. of coke each. The empties run back upon one line, while the full ones come in upon the other.

The arrangement has worked with perfect smoothness, and great success and economy (the saving of labour in this department being four-fifths) during the past six months. The whole of the works and the scheme were designed, as already stated, by Mr. Thomas Canning, and were carried out, under his supervision and that of Mr. Herbert Canning, by the firm of Messrs. Willey & Co., of Exeter. Messrs. Willey were the sole Contractors under the Company; but the engine was made by Messrs. Crossley Bros., of Manchester, the hoisting machinery by Messrs. Pickerings, Limited, of Stockton-on-Tees, and the trams by J. & F. Howard, of Bedford. The work has been well executed, has given great satisfaction in action, and from its durable character may be expected to continue to do so. A special feature, to which attention may, in conclusion, be drawn, is that the motive power is gas.

The cost of traction and elevation, bringing the coke 200 yards, and elevating it 40 feet, is 1·27d. per ton. To this must be added the cost of filling trams, and trimming wagons, which amounts to 2d. per ton—making a total of 3·27d. per ton. Fifteen cubic feet of gas remove a ton of coke—that is to say, a little over ½ lb. of coal gas through the gas-engine, conveys 2240 lbs. of coke, in addition to the weight of the trams, through 600 feet, and lifts the same weight vertically 40 feet. The charge for transporting materials of higher specific gravity than coke would cost less in the handling. The lines, too, it is obvious can be extended to any part of the yard or works when required.

The Acetylene Exhibition and Congress at Buda-Pesth.—This congress was brought to a close on the 24th ult., when the Hungarian President, Dr. E. Wagner, delivered a short address, in which he expressed the conviction that the work in which the members had been engaged had not been fruitless. Attention had been directed to various questions—some dealing with the cheapening of carbide, and others bearing upon the improvement of acetylene generators with the view of minimizing the inconveniences attending the use of the new gas, as well as increasing its utility and that of the raw material. The exhibition which had been held had been very successful, owing to the labours of M. Victor Berdenich and his colleague M. Cornel Boross, both of whom were cordially thanked.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Spring Excursion Meeting.

The members of this Association visited their President (Mr. J. S. Reeves) at Bilston last Wednesday. Glorious summer weather and the long friendship which has existed between Mr. Reeves and many of the members were no doubt the two factors which had most influence in bringing together the fine muster which was to be seen in front of the High-Level Station at Wolverhampton just before noon. From thence, brakes conveyed, without delay, the party to the Bilston Gas-Works, where they received in the Board-room a cordial welcome at the hands of the President and three of his Directors—Mr. Harold Holcroft (son of the Chairman), Mr. J. W. Hall, and Alderman J. Annan, an old member of the Association, and former Engineer of the Wolverhampton Gas Company's works. Light refreshments, kindly provided by the President, were disposed of with just appreciation; and then the members prepared to inspect the works.

Before leaving, however, the President took the opportunity of making his visitors acquainted with some important work which he has in progress, in order to bring his retort-house arrangements up to date. The work comprises the adaptation of the house to coal breakers, elevators, and conveyors, and West's manual charging machinery, and the installation of the plant. We give an account of the work in hand in the President's own words: The alterations and additions already arranged for consist of the removal of the railway sidings from the inner to the outer sides of the coal-stores, the setting back of the columns supporting the roofs of retort-house and coal-stores, and the erection of eight additional steel box-girders extending from the coal store walls to the main girders of the roofs. Also the construction underground of engine-houses, the walls of which will be lined with white glazed bricks, the supply of two 10-horse power steam-engines, two coal-breakers, each fitted with two sets of steel claws, and two elevators, provided with Hunt's patent roller link chains and 12-inch buckets. There will also be a conveyor extending across the retort-stack, with gearing so arranged that the conveyor can be driven as desired from the head of either elevator. The present roof of the retort-house not being sufficiently high to admit of elevators and conveyors, a portion of it will be cut away and a new roof erected in lieu of it. Two sets of West's manual charging-machines will be provided, with coal-hoppers carried by travelling trolleys. The power to raise and adjust these hoppers will be obtained by rope gearing from the heads of the coal-elevators. There will also be a fixed storage hopper on each side of the house, from which the travelling hoppers will be fed as they pass under. The charging and drawing machines will travel along rails in front of the retort-benches; but a slight curve in the rails will be necessary to meet the varying line of the retort-benches. The coke will be drawn from the retorts into waggons as at present, and be run underneath water-tanks where it will be quenched. West's Gas Improvement Company have the contract for the alterations to the roofs and the supply of the machinery. The brickwork and alterations to the railway sidings are being carried out by the Gas Company under the direction of their Manager.

After the reading of the foregoing, the members rambled through the works. They inspected the site of the additions so succinctly described; and saw something of what the President is able to accomplish with his Klönne furnaces, as modified by Mr. R. O. Paterson, of Cheltenham. It was also seen that Mr. Reeves is not a believer in hydraulic mains; and his belief is based, we believe, on a six years' experience. These and several other interesting features of the works were minutely investigated and ultimately praised by the visitors, none of whom, so far as could be gathered, had an adverse criticism to pass on what Mr. Paterson later in the day aptly termed the "inside secrets" of the works. As to the nature of some of these, more may be learnt by a perusal of the address delivered by the President at the annual meeting in March last (*ante*, p. 581).

Again mounting the conveyances, the members had a very agreeable drive, for the most part through beautifully green and well-wooded scenery, to the Wombourn water pumping-station of the Bilston District Council; and a very interesting visit it proved to be. They were received there by the Engineer, Mr. C. L. N. Wilson, Assoc.M.Inst.C.E., who gave them most courteous attention. The station is very prettily situated, and consists of a noble castle-like, red (Ruabon) pressed-brick building, with Hollington stone dressing, window heads, &c. It is divided into area and pump room, engine-house, well-house, and a small fitting-shop, boiler-house, and coal-store. The stack, which is also of red Ruabon bricks, is 90 feet in height. There are two engines of the vertical triple-expansion type, and surface condensing, with three force pumps placed directly underneath the crank-shaft, and two well pumps driven from a pin in a disc at the end of the crank-shaft, connected with a pitman of pitch pine to a pair of rocking bobs placed over the well; the pumps being about 140 feet from the surface of the well. The works were designed by Mr. Baldwin Latham, and were carried out with Mr. Wilson as Resident-Engineer. The total amount spent on the undertaking by the end of last year was about £61,000; but of this £16,750 was paid to the Wolverhampton Corporation for their right of supply in Bilston and Coseley. The visitors were much pleased with the bright appearance of the station; and they agreed that Bilston and the Engineer are to be congratulated on the splendid supply water which they possess there. If one criticism can be passed upon the station, it is that the main building would have been better if of larger dimensions. The beautiful machinery looked rather cramped, and at the time of the visit on Wednesday, the temperature inside was anything but a comfortable one. The town was first supplied from the works on July 2, 1896; but they were not formally opened until some twelve months later.

The return drive was a thoroughly enjoyable one; and it ended at the Victoria Hotel, Wolverhampton, where the Directors of the Bilston Gas Company entertained the members to what was modestly termed a "lunch," but which was really a generous repast. The Chairman of the Company (Mr. T. Holcroft, J.P.) presided; and he was supported on the left by the three co-Directors already named, and on the right by the President and the Honorary Secretary of the Association (Mr. Chas. Meiklejohn). There was a short toast list, in the course of which the Chairman related a little anecdote of some historical interest to gas engineers. He said that, when Napoleon shut up the Russian ports, the difficulty cropped up as to how tar was to be obtained in this country. At that time a club existed known as the Lunar Club; consisting of James Watt, Boulton, Murdoch, Dr. Priestman, and others. The question of the supply of tar came before the members. Among them was John Wilkinson, and he was one of the cleverest of the lot, although he had not since come so prominently before the book world. It was he who developed the manufacture of iron in the district. The result of these men laying their heads together was that they (this was about 1806) came to the conclusion that they could get the tar they wanted from coal; and the place where they started to distil coal for the purpose was in Bilston. It was even now called the Tar Oven. They filled the ovens with coal; and in distilling it they necessarily produced gas, which they let out at the top of the ovens. When the gas fired, it, of course, created a considerable light in the neighbourhood. Murdoch being one of the members, there was no doubt, said Mr. Holcroft, that it was this circumstance that led to the manufacture of coal gas. The little narrative of the Chairman's was much appreciated. On behalf of the Association, Mr. Paterson acknowledged the hospitality which the Directors had shown throughout the day, and which, as he expressed it, was "by no means a blank one in the history of the Association."

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

An Excursion to Kendal.

A very similar programme was prepared for the Manchester District Institution of Gas Engineers on Saturday as that which engaged the attention of the Midland Association earlier in the week—the members of both bodies visiting the gas and water works supplying the districts where the meetings were held, and filling up the balance of the day enjoying the hospitality of those identified with the gas supply undertakings of the localities, and driving through parts of the districts concerned.

The Manchester Institution excursion was to Kendal; and notwithstanding the fact that the town is almost at the extreme northern border of the extensive district covered by the rules of the Society, there was an unusually large turn-out of members; and a considerable number of them arranged to spend the week-end amid the surrounding lake scenery. On arrival at Kendal, the members were met by the President (Mr. R. G. Shadbolt, of Grantham) and Mr. T. N. Ritson, the Engineer of the Kendal Corporation Gas and Water Works, and were at once driven to the Town Hall, where they were entertained at luncheon by the Mayor and Corporation. The Chairman of the Gas Committee (Mr. Alderman Monkhouse) presided; and he was ably supported by the Mayor, the Deputy-Mayor, and several other members of the Corporation. The courtesy thus shown to the Institution was cordially acknowledged by Mr. Thomas Newbigging, to whom was entrusted the subsequent toast of "Success to the Borough of Kendal."

Before leaving the Town Hall, the only formal business which is ever transacted at these excursion meetings was speedily got through. The Hon. Secretary (Mr. S. S. Mellor, of Northwich) read the minutes of the previous meeting, held in Manchester in February, and they were confirmed. Thereafter, three new members were duly elected—Mr. Frank Barrett, of Ramsbottom, Mr. James Crook, of Kirkham, and Mr. Charles Potts, of Hyde.

Resuming their seats in the brakes, the members were driven to the gas-works, and an interesting half-hour was spent in an inspection of the plant and machinery here, which were all fully described in a paper Mr. Ritson had thoughtfully prepared and had distributed earlier in the day. A still longer drive through lovely sylvan scenery brought the party to the new Fisher Tarn Reservoir of the Kendal Water-Works, the main features of which (also described by Mr. Ritson in his paper) were closely scrutinized by the members. On returning to the Town Hall, tea was served; and after further acknowledgment of the obligation under which the Institution had been placed by the Corporation

and Mr. Ritson, for the admirable character of the day's programme, the proceedings ended, and the return journey (for those who had to leave the district) was made amid expressions of great satisfaction at the pleasurable character of the outing.

A Description of the Kendal Corporation Gas and Water Undertaking, prepared for the Manchester District Institution of Gas Engineers, by Mr. T. N. Ritson, the Engineer.

Gentlemen,—First of all I must thank you for the honour you have conferred upon me in selecting the ancient borough of Kendal as the place for the One Hundred and Eighteenth Quarterly Meeting of our Institution; and, in the second place, I wish to accord you a very hearty welcome. Naturally in a medium sized gas-works, such as Kendal, we cannot be expected to offer attractions in the shape of mechanical and labour-saving appliances, such as many of you are accustomed to, or have had the opportunities of seeing at the various large gas undertakings you have had the pleasure of inspecting from time to time. I trust, however, that what you may see in your tour of inspection to-day will be found interesting and acceptable. While we cannot boast of large gas and water undertakings, at the same time, I believe you will find everything modern and of a progressive nature.

GAS-WORKS.

The first undertaking for the supply of gas to the borough of Kendal was established in 1824, under the title of the Kendal Gaslight Company. Kendal was first lighted with gas on the 25th of July, 1825; the event being celebrated by general rejoicings and a public procession. The capital was £6000; and for further extensions it was increased to £7600. The works were transferred to the Kendal Union Gas and Water Company, who promoted a Bill in Parliament, which received the Royal Assent on the 26th of June, 1846, "for the purpose of affording a cheaper and better supply of gas light and water to the inhabitants of Kendal." The capital was then fixed at £30,000, with further power to borrow on mortgage or bond up to £10,000; and the shares of the old Company were merged in the new Company as preferential, and entitled to 7½ per cent. per annum dividend, with the option of conversion into ordinary shares, up to the 1st of January, 1851 (but which was never exercised). The undertaking was transferred to the Corporation of Kendal, under an Act of Parliament which received the Royal Assent on the 20th of July, 1894. This Act authorized the borrowing of £142,625, divided into the following heads:—

For the purchase of the gas and water works	£80,000
To the old Company, for expenses on account of transfer	350
For redeeming the bonds of the old Company	5,350
For providing working capital	4,060
For stamping deed of transfer, &c.	440
For further extension of gas-works	21,000
For further extension of water-works	28,800
For expenses of Gas and Water Act (amount actually spent)	2,625
	£142,625

A legacy of £30,848 was received from the Executors of the late Alderman Bindloss (who was six times Mayor of Kendal) for the purpose of future expenditure on extensions and improvements of the water-works. This has been spent on the new Fisher Tarn Reservoir, which is now almost completed, and which you will have the opportunity of visiting to-day.

The capital expended on the combined undertakings to March 31 last is as follows:—

On gas-works	£61,904	5	10
On water-works	75,511	9	2
	£137,415	15	0

Gas-Works.—The present gas-works occupies an area of about 2 acres. The following table gives the progress of the works, at intervals, from 1846:—

Year.	Gas Made. Cubic Feet.		Price of Gas per 1000 Cubic Feet.	s.	d.	
1846	6,000,000	..	1846–1853	7	6	With discounts.
1856	10,134,000	..	1854–1856	6	3	
1866	19,289,500	..	1857–1864	5	0	
			1865–1871	4	2	
1876	26,106,200	..	1872	4	7	
			1873–1879	5	0	
1886	38,050,400	..	1880–1885	3	9	
			1886–1887	4	0	
1896	51,096,700	..	1888	3	9 & 3	6
			1889–1896	3	6 & 3	4
1899	61,541,000	..	1897–1899	3	3 & 3	1
			Public Lighting		2	10

The gross profits of the combined gas and water undertakings have been as follows: 1856, £1773; 1866, £2426; 1876, £3057; 1886, £3507; 1896, £4313 (charge for first W.C. abolished; also half-year's gas-meter rents abolished); 1899, £5060 19s. 7d. (gas reduced 3d. per 1000 cubic feet).

Retort-House.—The retort-house is 114 feet long, 60 feet wide, and 20 feet high to the eaves, and is capable of producing over 1 million cubic feet of gas per day. There are at present four settings of retorts built on Drake's generator principle (with subways), which contain 28 retorts, and four settings built on Hislop's regenerator principle (with subways) containing 28 retorts with provision for 32.

Coal-Store.—The coal-store, adjoining the canal, is capable of accommodating about 900 tons of coal; but an additional store is to be erected shortly.

Condensers.—The condensers consist of six annular steel tubes, 20 feet high by 2 ft. 8 in. in diameter, and are capable of dealing with half-a-million cubic feet of gas per day.

Engine and Exhauster House.—In the engine and exhauster house are two combined engines and exhausters by Messrs. Waller and Co., of London, having a capacity of 20,000 cubic feet per hour each.

Boiler-House, Boilers, and Fitting Shop.—The boiler-house contains two Cornish boilers, 19 feet long by 5 ft. 6 in. in diameter, with gas-fitting shop overhead.

Washer.—A Holmes's patent rotary washer-scrubber was erected in the autumn of 1895, and is capable of dealing with half-a-million cubic feet of gas per day. This washer completely purifies the gas from ammonia with from 10 to 12 gallons of water per ton of coal carbonized, leaving only 0·3 to 0·5 grain of ammonia in the gas at the outlet. Since this machine was erected, the yield of sulphate of ammonia has been more than doubled.

Scrubber.—The scrubber is 40 feet high by 5 feet in diameter, filled with wood grids.

Purifiers.—The purifying-house is 62 ft. 3 in. by 50 feet by 16 feet to the eaves, and contains six purifiers, 16 feet square by 5 feet deep, built on the overhead principle. These are capable of purifying half-a-million cubic feet of gas per day. The oxide revivifying shed is underneath; and the oxide is fed into the purifiers by elevating machinery.

Meter-House.—This building, with the smith's shop and sulphate of ammonia store, has recently been re-constructed. The meter is capable of dealing with 20,000 cubic feet of gas per hour.

Liquor, Tar Tanks, and Pumps.—In addition to the underground tar and liquor wells, there are two overhead tanks, having a total capacity of 12,000 gallons.

Governor-House.—The governor-house contains two of Wm. Cowan's patent equilibrium governors, fitted with Ritson's overflows. The gasholder valves are also in this house.

Sulphate of Ammonia Plant.—This plant is capable of making from 10 to 15 cwt. of salt per day.

Carburetter.—The carburetter is of the "Price" pattern; carburine or benzol being used for enriching purposes.

Gasholders.—There are three gasholders, having a total capacity of 212,000 cubic feet. The heaviest day's consumption of gas last year was 336,000 cubic feet. It will be observed that the gasholder storage capacity is about 60 per cent. below the heaviest day's output. Powers are now being obtained to acquire additional land to erect a 90-feet telescopic gasholder next year.

Chemical Laboratory.—There is a complete chemical laboratory fitted up with a bunsen photometer by Messrs. Alexander Wright and Co., of London, together with apparatus for testing crude and purified gas, the material used in purification, bye products, furnace gases, tar, &c.

Mains.—There are about 20 miles of gas-mains; the trunk mains being 8 inches and 6 inches in diameter respectively.

Unaccounted-for Gas.—The unaccounted-for gas has been reduced from 13 per cent. in 1891 to 5·85 per cent. in 1899.

Consumers.—There were, on the 31st of March last, 1984 consumers on the books; and the total gas sold for the year amounted to 56,934,200 cubic feet, made up as follows:—

	Cubic Feet.	Per Cent.
1468 consumers by ordinary meters	36,829,700 =	64·68
516 do. by prepayment do.	2,881,500 =	5·06
284 ordinary street lamps and 74 High Power Lamps	7,105,000 =	12·48
330 gas cooking-ranges	5,831,700 =	10·24
60 gas-engines	4,286,300 =	7·54
	56,934,200 =	100·00

Since the undertaking was acquired by the Corporation, gas-meter rents have been abolished, and the price of gas reduced 3d. per 1000 cubic feet. In the Water Department, the charge for the first W.C. has been abolished. In addition to the contributions to the sinking fund, amounting to £5203 10s. 2d., the reserve fund now stands at: Gas, £2255 10s. 11d.; water, £1055 2s. 11d.; and there is this year's surplus, amounting to £1104 18s. 1d., to deal with. In addition, £500 was given last year towards relieving the rates, due to the disastrous flood on the 2nd of November.

ELECTRIC LIGHT.

Preparations are now being made to obtain powers to erect an electric lighting station upon the site of the gas-works, and to be worked conjointly with that undertaking.

WATER-WORKS.

The water supply at present is partly gravitation and partly pumping. The gravitation works consist of two reservoirs at Bird's Park. The lower reservoir is 400 feet above Ordnance datum. Its construction was commenced in 1846, and completed in 1848. The upper reservoir is 464 feet above Ordnance datum. It was constructed in 1856. The drainage area comprises about 210 acres. The capacity of both reservoirs is about 18 million gallons, which is altogether out of proportion to the gathering ground and requirements of Kendal. The pumping

plant at Mints Feet was constructed in 1869-70. It consists of two of Cameron's direct double-action ram-pumps; and steam is supplied from two Lancashire boilers. The pumps, when at work, deliver daily about 250,000 gallons of water direct into a 6-inch main, which joins the 8-inch main from the lower reservoir. In 1892—when I took over the gas and water undertaking—the consumption of water was between 35 and 40 gallons per head of the population. In 1894, steps were taken to overhaul the mains, service pipes, and consumers' fittings; Deacon's differentiating waste-water meters being introduced, to aid in localizing and detecting underground or hidden leakage and waste. Since the commencement of operations for the detection and prevention of leakage and waste of water, some 250 defective service pipes have been renewed, and numerous defects in mains remedied, together with innumerable repairs to consumers' fittings and apparatus. The stoppage of one single leak in a main increased the pressure in the particular district by 50 lbs. per square inch. The stoppage of these leaks has materially improved the supply of water to the town; and the result has been a saving of £450 to £500 a year in pumping charges. The consumption of water at present is as follows: High-level service supply, 17 gallons per head of the population; low-level service supply, 25 gallons per head of the population—equal to a daily consumption of 331,000 gallons. When the Fisher Tarn Reservoir is complete the pumping station will be discontinued.

MAINS.—There are about 25 miles of water-mains, the trunk mains being 8 inches and 6 inches in diameter respectively. The following figures show the increases in the water rental at intervals from 1856: 1856, £791; 1866, £1283; 1876, £1842; 1886, £2570; 1896, £2767 (charge for first W.C. abolished); 1899, £3085 9s. 5d.

RAINFALL.—The average rainfall for the past 40 years is 51·02 inches.

FISHER TARN NEW RESERVOIR.

This reservoir has been designed by Mr. G. F. Deacon, M.Inst.C.E., of London, who has also acted as responsible Consulting Engineer for the work; the position of Resident Engineer having been ably filled by Mr. J. H. Parkin, Assoc.M.Inst.C.E.

The reservoir, which was commenced in July, 1895, is situated about 742 feet above Ordnance datum, and occupies an area of 31 acres; the capacity being 120 million gallons.

The dam is 407 yards long, and was the first of its kind constructed in this country; the foundations from the ground level to the solid rock being composed of lias lime concrete, while the superstructure is built in solid masonry laid in lias lime mortar. The greatest height of the dam, at the bye-wash, is 44 ft. 6 in.; and the width varies in accordance with the height of the earthern embankment which extends for the greater part of the length of the dam.

Provision for dealing with the flood water is by means of a bye-wash formed in the masonry work of the dam, which is suitably ornamented by turrets on each side. The parapet of the dam is 6 ft. 8 in. wide, and is formed of concrete blocks.

The stone, which is of the Silurian formation, was obtained from a quarry upon the site. Blake and Marsden machines were employed to break and crush the rock into macadam; and suitable pulverizers and rolling mills were used for making the sand employed for concrete. The best and largest stones were dressed for the facework. The lias lime, after being slaked, was passed through a mortar mill, and afterwards ground to a fine state in a "Burr" stone mill, from whence it was conveyed automatically to the store tank before being measured into the concrete and mortar mixers.

The water is drawn off by means of a telescopic tube connected to a float, so arranged that the water is always drawn off a few feet below the surface.

In the valve-house, at the foot of the bye-wash, are fitted the outlet and scour pipe valves; also apparatus for regulating the compensation water (which is fixed at 60,000 gallons per day), and a Deacon differentiating meter for measuring the supply.

The area of the natural gathering ground is about 160 acres; but an intercepting drain has been laid so as to tap another 80 acres, and also some 50 acres of the Bird's Park gathering ground. The total gathering ground of all three reservoirs is about 450 acres.

A 15-inch main will convey the water to the present reservoirs, where it is contemplated to erect filter-beds. Provision has been made in this pipe-line so that advantage may be taken, if so desired, of the water power available to generate electricity by means of turbines erected near Bird's Park lower reservoir.

Impounding commenced on the 2nd of February last; and at the present time there are some 70 million gallons of water in the reservoir.

The dam is practically finished; and it is expected that the whole of the work will be completed in three or four months from the present time.

Among the honours conferred by Her Majesty on the occasion of the anniversary of her birthday, are knighthoods for Mr. J. F. ROTTON, Q.C., late legal adviser to the Local Government Board, and Mr. W. MURTON, C.B., Solicitor to the Board of Trade; while Mr. W. H. PREECE, the Consulting Electrician to the Post Office, and Professor MICHAEL FOSTER, the President-Elect of the British Association, are to be K.C.B.'s.

BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

Annual Meeting, June 5 to 7, 1899.

INAUGURAL ADDRESS OF THE PRESIDENT,

Mr. W. WATTS, F.G.S., &c.

Gentlemen.—My thanks are due to you for the honour you have done me in electing me your President for the ensuing year. The position is one of dignity and importance; and I know that I shall receive your sympathy and support in my desire to worthily maintain it. I shall endeavour to promote your interests to the utmost of my ability, and perform the duties of my high office with advantage to the Association and satisfaction to its individual members. To disseminate knowledge among our members, and impart to each other the results of experience, will be no light task, if we must maintain an honourable position among kindred associations, and deserve the confidence the public place in us. We can individually help forward the objects of the Association by contributing original papers dealing with our own works and experience, and thus benefit others.

Few men are strictly original; and it is a mistake to suppose that we lessen our chances of success by helping others. The feeble minded are always suspicious; but they seldom rise high in their profession. I assume that no engineer will undertake the duties of an important office unless he feels competent to discharge them without having to resort to outside help on every occasion when he meets with difficulties. No man is perfectly trained in all the branches of an engineer's profession; but it is by no means uncommon to find men undertaking every species of work they can lay hold of, and trusting to Providence and outside help to pull them through. Personal influence and connections are of consequence in society; but they can never of themselves claim the praise due to knowledge and experience. No branch of our profession suffers more from the interference of inexperienced men than water-works engineering. Every local tyro who can level and make a section thinks he can lay pipes, direct the distribution of water in a town, and construct works, and proclaims himself as visibly as possible on his official notepaper.

I have heard it remarked that it does not pay to be too modest in business; but surely right conduct is of consequence to all, and no man should try to reach beyond the limits of his genius, lest he thereby exposes his incapacity. The class of men to whom I am referring resort to the professional weekly papers for information on all sorts of subjects pertinent to their office. A asks what books to read on bridges and strains on girders; B wishes to know the pressure of water on a wall at a given depth below the surface; C is puzzled to know what diameter and length of pipe he should lay, and whether he should specify lead or turned or bored joints; and D wishes to supply a village with water, and wants to know what size main to put down to deliver a given number of gallons to a prescribed population. Such questions as these should not be answered, for it is evident the querists are inexperienced men, and have had no special training in the duties of their office, and are not readers. Questions, however, if asked by a pupil are permissible; but he should be able to obtain the information in the office in which he is articled, and not have to appeal to public journals. A man who desires knowledge is sure to find it; and it is no disgrace to ask questions, unless it is to carry on a work which he does not understand.

I am not sure that the class of men to whom I am alluding is entirely to blame. Some of them may have had positions conferred upon them by the Civic Fathers in the mistaken notion that money was being saved by engaging a man and training him as they would like him, or by doubling an appointment. The vanity of some men yields to temptation which adds emoluments to an office; and they yield and accept in the hope of being able to pull through somehow. Ill-designed and badly constructed work must be expected from such sources; but it is not heard of except in extreme cases, and when too late to remedy it. Inferior men sometimes have attractive powers of speech and manners which are mistaken for ability, and overshadow the genius of the quiet, unobtrusive men. At all events, the odds are against the silent workman; and the gushing man gets to the front before he is found out.

Scarcely a week passes without advertisements appearing in the professional journals for public officials at abnormally low salaries—indeed, salaries sometimes almost too low to offer to a mason, a bricksetter, or a joiner. To these appeals many responses flow in; and the difficulty follows in making the selection, unless the individual is decided upon beforehand. It is not to be wondered at, therefore, why appealing questions for help of the character just referred to are heard. It cannot be expected that suitable and experienced men will apply for positions of such responsibility at salaries which respectable artisans would not accept. The result is that many official appointments are occupied by men of little ability, and perhaps with no other recommendation than a silken tongue in place of experience. They can only discharge their duties and act according to their limited experience. The quiet plodding man is careful in what he does, and one can help him with pleasure; a pretentious man makes frequent mistakes, ere he condescends

to ask questions, and in the meantime errors of judgment are often irremediably made.

I plead for the best men to have the best appointments in every branch of professional life, regardless of how they have obtained their knowledge and experience. A man cannot design and carry on works if he has no knowledge of the nature of the material to be employed in his superstructures and of the use and qualities of the various parts. Themistocles said he could not fiddle, but he could make a small town great. This is a ring all good men have in them who attempt no more than they can do.

I fear that in many cases full justice is not done by engineers to their articled pupils. It has always seemed to me that a solemn obligation is incurred in taking an articled pupil. The pupil pays his fee and devotes three or four years of the most important period of his life in the expectation of being taught the elements of his profession; and when his pupilage days are ended, it may be found that he is not fit to take a foreman's position on a respectable job. Usually for the first few months of his term he is a fag in the office. Later on, he begins to trace finished drawings, and in a busy office he is kept well at this class of work during the greater part of his term. In a small office, it is difficult to say how the time is spent; and it is also difficult to say what such pupils are fit for when turned out at the end of their term. I do not assume that dull heads can be made intellectually bright by severe pupilage; but all minds can be sharpened by study. Many pupils have reason to complain of the slender opportunities which are given them of finding professional nutriment to qualify them for satisfactory appointments at the end of their pupilage days. Some, however, obtain positions, and struggle on as best they can while engaged in their arduous duties, and endeavour to complete the training which has thus been neglected. Those who rely upon themselves for all manner of help succeed. They learn to note and observe; and these are fine qualities in young men. Some pupils never see the finished work the plans of which they have assisted to prepare. There is nothing more cheering to a thoughtful pupil than to be permitted to visit the works and witness the development of his office designs. New inspiration is drawn from what he sees; and he returns to the office a wiser man, and better able to design, having learned something of the nature of material and the manner of placing it in position.

Pupils should not be articled unless they can be guaranteed a proper training; and the engineer with whom they are articled should not only be able to teach them, but be compelled to offer them every facility to acquire a thorough knowledge of his profession. The cleverest engineers have not all been trained in busy offices or inside an office, but outside, with nothing to guide them except their own genius. A busy chief has not the time to devote to the training of his pupils; and he hands them over to other persons, and rarely sees them. His name, however, helps them in after-life; but reputations depending on names are not lasting, unless there are knowledge and natural ability to support them. Young men who have had the advantage of a professional pupilage claim a position in the profession not conferred upon a cleverer man who has not had the same advantages, but who has in the power of observation and practical training outstripped his rival.

Young engineers kept pent up in the offices are very helpless when they first turn out on to the works, and are manifestly unfit to assume personal responsibility on large works. They find out for the first time that they have still a practical course of training to go through, more important than the first, to become a successful engineer. Formulæ, in a great measure, can be learned at home, assisted by college classes of an evening. But practical experience can be acquired only on the works; and a student who combines the two departments, office work and outside experience, has superior advantages. He early learns the use of implements and material, and is daily brought into contact with structural work. The habits of workmen and the resources of Nature are hourly presented to him; and he stores his mind with experience to enable him, when difficulties arise, to act while an inexperienced man is thinking. Poor ideas expressed on neat drawings make no man great; and good material used in works badly put together under careless supervision, are poor recommendations of ability, no matter where a man may have been trained.

So long as a man qualifies himself for the duties of his professional life, I do not see that it matters how and where his knowledge is obtained. This idea, however, is probably not held by the majority of engineers. No matter how hard an artisan works to improve his mental condition by attending college classes of an evening while working at his trade during the day, he has serious obstacles to overcome before he can make his way to the front, owing to custom, and, in a measure, to family connections. A dull pupil articled to an engineer with a poor practice still stands professionally higher than a clever workman who, by natural aptitude, unassisted hard work, and self-tuition at home and on the works on which he is engaged, has qualified himself as an engineer. Recently, however, the Institution of Civil Engineers, in some measure, have broken down this class barrier, and made it possible for the poorest lad to be admitted a member by examination; so that no one can now complain of his chances of success as an engineer.

A man's early environment has not a little to do with success or failure in his profession. His training and home life may fail to influence his manners and flow of language to his advantage. He may have the ideas without being able to express them fluently; while a fluent talker may have feeble ideas, and be ready at nibbling at those of others without being able to suggest any of his own. Some men fail owing to a want of confidence in themselves; while others succeed by having too much, and boldly rush on "where angels fear to tread." A man who advertises himself by other means than good works and character is to be avoided. Many young engineers make a great fuss about titles, especially when seeking appointments, and speak slightingly of others who do not possess them, although better men. Titles can never claim the praise due to knowledge. Some men live on them; and if they are taken away, very little remains of the man. Many of the best engineers have raised themselves to the highest pinnacle of their profession without titles; while men in the profession have had them conferred late in life, when they were of little use to them.

The duties of water-works engineers are too onerous and responsible to be undertaken with indifference, either in matter of designing or constructing; and no part of the works should be left in careless hands. More failures are due to a want of strict supervision and constant oversight than any other cause. Water can never be dispensed with, nor can a substitute be found for it. It is one of the primary requisites of life, and unlimited in quantity. It possesses an enhanced value, however, in consequence of its having to be collected, stored, and clarified, before it is fit for human consumption. During the present session of Parliament, about sixty Bills are being promoted for the extension of hydraulic works, the expenditure on which will amount in the aggregate to several millions sterling, and the capital of existing works already stands at 48½ millions. Probably at no time in the history of water-works for domestic supply, have such gigantic and valuable schemes been before the country.

The future outlook for water-works engineers is bright and cheery. There is sure to be a demand for good men; and it is worth the while of every young engineer of ability to prepare himself for what is coming. Year by year the population of the country is steadily increasing, and the habits of the people are getting more refined. Sources of water supply are becoming more scarce and difficult to obtain; while the average rate of consumption is increasing. Unless, therefore, means can be devised to lessen the rate of consumption per unit of population for purely domestic supply, the genius of the water engineer is sure to be taxed to find water for the wants of the rising generation. Everywhere the smaller supplies near home are being taken up or polluted by the spread of population, farming, or extension of trade.

No doubt a great waste of water is allowed to take place in most large cities and towns, by not adopting well-known modes of checking the daily and nightly rate of consumption at the head of the works. No supplies of importance should be without meters at the source, to measure all the water flowing from gravitation works. Pumping-stations are fairly well seen after in this respect by recording the strokes of the pumps; but meters are surer guides.

If stores of water for domestic and trade supplies were separated, a saving would be effected; but a dual set of mains would be required. In duplicating the mains, it is necessary only that they should be doubled in the manufacturing parts of the town; but a separate pipe would be required from the works. There are many advantages in favour of this system held back by questions of first cost. Why, for instance, should water be filtered for street watering, foundry use, hydraulic lifts, and many other trade uses? The cost of extra filter-beds, plant, and labour would go a long way towards providing a dual system of pipes; and in many drainage areas water could be collected at the lower reaches and utilized, which is rejected as unfit for human consumption owing to the polluted nature of the land.

The roofing space in large towns is capable of collecting supplies of water for many purposes other than domestic supply, if means were taken to store it. Every inch of rainfall provides 22,613 gallons of water per acre, which, when it runs to waste in driblets, does little good, whereas if it were collected in specially provided cisterns at an elevation it would become stored energy ready for use. The flat roofs of some of the Lancashire cotton mills provide fair supplies of water in case of fire and other purposes; and it seems to me that the plan might be extended to many buildings with advantage.

There is the waste heat also from coke-ovens, furnaces, and refuse destructors which could, in many instances, be utilized for pumping from inferior sources for many uses in large centres of population. Mains under less pressure would serve them, than if served from mains under pressure to supply a physically irregular town. I do not expect that the ideas here suggested will ever be entertained by a corporate body; but there may be individual cases where private firms could adopt them to advantage.

While speaking on the economical side of my subject, it seems to me not improbable that in the future brackish water will be more extensively used in towns near to the sea, and that the undulating motion of the tides will be made use of mechanically. Oceanic water will perhaps never be evaporated in such large quantities as to be useful for man as a potable water, unless the sun's rays can be directed upon it in a concentrated form, and

condensation made to ensue as required. One does not know, however, what benefits are in store for the future race of mankind; but it seems evident that for many years to come water engineers will have to deal with the rainfall on earth, in its condensed form, rather than in a vapoury condition floating in air. Evaporation and condensation are laws well understood; but to bring them into general application, on a large scale, to supply human wants, will tax the energy of man doubtless for ages to come. I am persuaded that a greater use could be made of the water existing in the earth's crust, in various parts of the country, in strata other than the permeable measures in the South of England.

Every engineer who has opened out concrete or puddle trenches in the Pennine Valleys, knows that large volumes of water are frequently met with not apparent at the surface, nor indicated by the vagaries of the diviner's mystic twig. In a trench 300 yards long by 80 feet deep, cut in black millstone grit shale, in the Little Don Valley, a constant stream of water equal to 40,000 gallons per hour was intercepted, and continued to flow for several months practically unabated. This influx of fine water amounts to 960,000 gallons per day, and would supply a population of 38,000 persons with 25 gallons each—indeed, a town supply of no mean pretentions. This is one only of a number of trenches I have opened out under favourable circumstances as regards the yield of water from saturated strata not visibly wet at the surface. On opening the shales, an experienced man soon discovers whether they are likely to prove wet or not; and he is guided by the position of the local faults which way to excavate to find the object of his search. There is a point, however, below which water is not found in most shales—called the saturated level; and below this it is of no use sinking if the search be for water only. A well sunk or a bore-hole made in saturated shales, does not always indicate the richness of the beds as regards the yield of water, as it may be put down wide of the hidden ducts or in comparatively dry ground. The measures require thorough tapping to yield their treasure, and ample storage room provided to deal with it. A rich underground water supply, in solid measures, depends greatly on the position and trend of the local faults, which must be studied to be understood. Compensation water has not to be given for the privilege of extracting water below the surface of the ground, although such water is derived from the rainfall, and would find its way to the surface as spring water if not pumped. The underground ducts, however, may extend for miles, and drain other drainage areas or river basins than where the wells are sunk or the springs flow. The physical features of a river basin are due to cosmical agencies, and determine the surface flow of rain water, but not underground sources.

Water rights are always jealously guarded; but occasionally claims are made for supposed rights which are singularly strange and one-sided. Custom, now and again, seems to override equity and common sense. A singular case came under my observation a few years ago, which serves to illustrate the force of this remark, and shows also how the deeds of dead men bind the living in privileges not strictly legal. An industrious moorland farmer adds to his agricultural pursuits the business of hatting, for which purpose he requires a small supply of water over and above what his domestic well yields. He arranges with a neighbouring farmer to cut an open channel across one of his fields to a mountain rivulet, where a perennial supply flows. He pays a small sum annually as an acknowledgment, and keeps the stream clear of obstruction. In the course of time, the business is given up, and the little building in which it was carried on falls into ruins; but the drain still exists. The farm and shop are on the slope of another water parting, and therefore the water conveyed in the open channel from the rivulet finds its way into another valley. These acts were clearly derogatory to the rights of the riparian owners, who should have asserted them at the time the diversion was made. Perhaps fifty years after the hatting business was started, a corporation seek to establish hydraulic works in the valley fed by the mountain rivulet, as one of its feeders, and purchase the field in which the duct existed, and which had practically disappeared by vegetable undergrowth as water lodged rather than ran in it. When the corporation proceeded to turn the water into its original and natural course, a descendant of the farmer who introduced the trade makes a claim upon the corporation for a supply of water he could not use, and either for love or fear the corporation agree to some compensation out of Court. This is one case only of many equally absurd claims made upon corporations for obsolete water rights, and acquired neighbourly privileges, which the law should forbid. It is no use submitting them to arbitration, where many highly-paid professional witnesses are engaged, as the winner loses if money be regarded as the standard of value in such cases.

Long before steam became the primary agent in driving machinery, water power was all important; and small mills were placed by the side of mountain streams in many of the Pennine Valleys. After the construction of canals, and the formation of railways, coal became cheap, and machinery moved by steam is more reliable than water power. In an upland valley with a limited drainage area, a precarious rainfall, and little dams, the small mills fell into disuse owing to the establishments of larger ones, keener competition, and general conditions favourable to the carrying on of a trade where social intercourse is more enjoyable than can possibly obtain in valleys difficult of approach, apart from the unfavourable climatic conditions natural to the elevated zones of our country. One by one the moorside mills fell into ruins, and the once prosperous valleys are now deserted. In some cases, reservoirs have been established on the sites of ruined mills; and in the course of negotiations for purchasing the properties, it is astonishing what singular claims are made for the old and obsolete water rights, silted-up dams, and goits as useless as the ruined mills. I mention these cases as anomalies in the law which deals unfairly with water companies; and doubtless analogous cases have come under the notice of other engineers present at our meeting this morning.

The British Association of Water-Works Engineers embraces every branch of hydraulic engineering, including the construction of canals, river diversion, docks, well sinking, the construction of reservoirs, and all that pertains to the comfort and the enjoyment of mankind by the means of water. Many natural sources of water supply capable of generating mechanical power are neglected, owing to the cheapness of coal in driving prime movers. In many valleys in the Pennine Hills, rapidly inclining streams and waterfalls could be utilized for electrical and other purposes; but they are unable to compete in primary cost. As coal gets scarcer, however, these natural agencies will be resorted to for motive power. The use of water power in limited areas is uncertain; but uncertain sources can be greatly improved by economizing the rainfall, providing ample storage, and allowing the smaller sources to do the lighter work and the larger the heavier. These ideas, however, are matters which the force of circumstances will deal with when the want is felt. Water falling on the higher reaches of the hills is sure to be made use of mechanically in time; and the pressure from the existing domestic reservoirs will not always be lost.

Take a valley, for example, in which a series of reservoirs exist one above another, where decanting daily goes on, from the first to the second, and the second to the third, and so on, wasting efficient power brought under control by existing works. By regulating the water supply of a town into zones, it seems possible to utilize the pressure in the mains from the works for motive power for many purposes of a light kind in a large city. Take a city, for instance, whose upper parts are 100 to 150 feet above the lower parts. Clearly the excess of pressure directed to the upper parts before it flows to the lower could be made use of by suitably arranged plant, and thereby pressure valves be done away with. I simply direct attention to this important question, but which would not be difficult to carry out in some towns known to me. The power, however, derived from water discharged at irregular intervals is not satisfactory; but experience teaches how to regulate natural forces beneficially for the race. Wherever water falls, or moves, from a higher to a lower level, work can be got out of it.

In directing the trunk mains from the source to the district of supply, they are laid under the roads leading to the town as a matter of convenience and cost; and very little thought is given as to whether it is better to serve the town upwards from the lower part, or downwards from the higher, or strike a mean and branch off from the middle of the district. One cannot do what is best always in such matters; and no two districts are physically alike in conformation or hydrostatic pressure. The subject, however, demands more thought than is given to it generally; and as a consequence the best results are not obtainable from the mains. The mode of directing the branches into a populous supply district, together with the proper sizes of pipes to put down, deserves the serious thought of every water-works engineer. It is a serious loss to a town to be enlarging the branches every few years; and this could be avoided at the outset by anticipating the probable increase of population and trade development in it.

Open taps relieve the main of some pressure, and slightly increase the velocity of the water; and it is well known to engineers that hydraulic flow and hydrostatic pressure cannot be obtained at the same moment of time to advantage. Indeed, water moving rapidly forward in a pipe possesses no more lateral pressure than water in an open river. The flushing of pipes requires more scientific attention than is usually given to it; and the branches should be placed at the bottom, and provision made for the flushing water to get freely away. It is objectionable to have the hydrant boxes open to the roadway or street; and they should not be submerged when in operation. All dead-ends should be avoided as much as possible, by arranging to continue the branches into the main after having served a district. At all events, a change of water wants to be frequently made to ensure purity of supply.

The advantage of having the mains and branches sufficiently large cannot be over-estimated. The relative cost of large over small pipes is not great. A 4-inch pipe, for instance, will discharge twice the amount of water of a 3-inch pipe, and costs about one-seventh more only under similar circumstances. Many illustrations could be given; but this one is sufficient. I am persuaded that many towns suffer a want of hydrostatic pressure owing to the smallness of the main and distributing branches failing to satisfy the conditions alluded to. A paper on the subject of service distribution would be very interesting; and any member bringing one forward would confer a benefit on the Association, and would deserve thanks for his labour.

The purification of drinking water is occupying the mind of every water-works engineer, and doubtless will continue to do so for a long time to come. For many years, I have advocated

the provision of ample storage room for moorland water, and separating the floods from the normal flow of the streams, and decanting after precipitation, exposure, and bleaching; and I am glad to find every practical bacteriologist suggesting the plan which has been so satisfactorily carried out at the Oldham works, where one of the best water supplies may be found without filtration. Flood water is not the worst water flowing from a large drainage area, although it is the most highly discoloured. When separated and allowed time to settle, it is more free from bacteria and peaty acidity than the partially dried-up streams in summer. Satisfactory arrangements for drawing the water off near the surface should always be made, both in decanting and supply reservoirs, to secure the purest water; and all drainage areas should be free from contamination of every kind. Filtration and straining improve water supplies. Where the drainage area is small and the storage capacity limited, filtration should be resorted to; but where the storage room amounts to 60,000 cubic feet per acre of drainage, most moorland waters can be satisfactorily passed through a strainer having about 900 meshes to the square inch in lieu of filtration. No doubt filtration greatly improves water for potable purposes, and eliminates the bacteria germs, which could not be done by straining; and an article of diet indispensable to man should be served pure. Filters, however, unless properly constructed, and attended to, are a source of danger; and many of those used, called cottage filters, are a nuisance. Speaking of water supplies from gravitation works in general, I am persuaded that, when the flood waters are properly separated from the streams in a normal state of flow, ample storage room is provided, and precipitation in bulk before decanting is made a primary structural condition, added to a pure drainage area, filtration becomes less of a necessity. Dr. Houston's examination of the waters supplying Oldham clearly demonstrated the advantages of separation, precipitation, and ample storage.

Besides attending to the domestic supplies of water to a city or town, I see no reason why the water-works engineer should not direct his attention to the use of water for the pleasure and enjoyment of the people in other ways. In the suburbs of many towns lie stretches of land on the margin of the rivers flowing through them, which at a little cost could be converted into beautiful lakes for boating in summer and skating in winter, and thus provide a healthy recreation for the people without the allurements and facilities for drinking and gambling so common at cricket and football resorts. Peaceful enjoyments of life are not catered for to the same extent as games of chance and strength, because they do not arouse the feelings, and people engage in them calmly and sober-headed. Near most great towns are rivers, on the margins of which shallow lakes could be formed for the purpose suggested; and it may be similar ideas have occurred to other members of the Association.

In reviewing the professional duties of hydraulic engineers, too much cannot be said in favour of making notes and tabulating them. The eye is trained to see, and the mind to observe, the phenomena of Nature; and a record is kept of the success or failure of one's work. By communicating to our professional brethren the results of our experience and observations, we shall ameliorate their burdens and anxieties and help them to sustain the responsibilities of their daily life, and at the same time elevate ourselves and justify the cherished object we have before us as members of the British Association of Water-Works Engineers.

Gas v. Electricity for Lighthouses.—The recent stranding of the *Paris* on the Manacles, following comparatively closely on the loss of the *Mohegan* on these dangerous rocks, has afforded Mr. John R. Wigham an opportunity of reiterating, in the columns of "The Times," his views and those of the late Professor Tyndall and others on the superiority of gas to electricity as a lighthouse illuminant. Mr. Wigham is of opinion that the chief cause of the accident to the *Paris* was the inefficiency of the Lizard light, which is electric; and, as our readers are aware, he has pointed out over and over again to the lighthouse authorities that these lights are worse than useless in fog or mist. Twenty years ago, when this subject came under discussion at the Institution of Civil Engineers, on the occasion of the reading by the late Sir James N. Douglass, the Engineer to the Trinity House, of a paper respecting the employment of electricity in lighthouses, Mr. Wigham gave his reasons for holding the views he has so frequently expressed; and he has now the gratification of knowing that nautical people have unanimously come to the same conclusion. Mr. Wigham quotes Captain Wilson Boyd, of the British and Irish Steam Packet Company, who is continually passing the Lizard lights, in support of his opinion. Captain Boyd says he has often passed quite close to the electric lights on the south coast in hazy weather, and has "found them invisible." To his mind, the electric light, as a lighthouse illuminant, is "quite useless." Mr. Wigham expresses the hope that the Board of Trade will deem it right to call upon the Trinity House to substitute for the electric light on the Lizard, which he characterizes as dangerous, large gas-flames such as are used in Irish lighthouses, notably that on Tory Island, which, as recorded by Professor Tyndall, has been picked up by vessels twenty or thirty miles off. The halo of this light can be seen four or five miles off through fog.

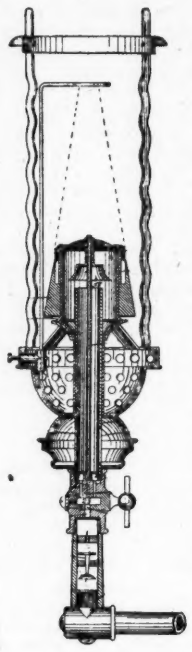
REGISTER OF PATENTS.

Atmospheric Burners.—Smith, W. B., of Chelsea, S.W. No. 9313; April 22, 1898.

This is a modification of an arrangement of burner described in patent No. 21,340 of 1895. The upper part of the new form of burner consists of practically two principal tubes, one inside the other; the space between being formed into compartments by partitions extending from the outer to the inner tube (or nearly so), whereby the gas and air, after ascending the inner tube together, descend one or more of the compartments and re-ascend by the remainder. As an alternative, the gas and air, after ascending together the most central compartment, descend by one or more compartments in the burner; and then the bulk of the gases, in changing from the descending to the re-ascending compartments, move in a direction not radial to the vertical axis of the most central compartment, but in such a direction as to partly encompass the most central compartment. The object aimed at is to make an atmospheric burner as short as is conveniently possible, and yet to give the gas and air sufficient time to become intimately mixed, or to more thoroughly mix the gas and air in the burner.

Gas-Burners.—Hall, G. A., Owen, E., and Dayton, G. E., of New York. No. 10,289; May 5, 1898.

To obviate what the patentees describe as "sources of difficulty" in the effective use of incandescent gas-burners, the present invention comprehends: First, a governor or regulator combined with a gas-burner, and operating automatically to produce a uniform flow of gas to the burner under varying or variable pressure; second, a non-expansible covering or jacket for the part in immediate proximity to, and liable to come in contact with, the mantle and to injure or break it by expansion under heat (and this part of the invention also comprehends the use of a non-heat-conducting covering or jacket to protect the metal burner and prevent it becoming highly heated and unduly expanded); and, third, a support for the base of the mantle to hold it against lateral movement relatively to the burner, and prevent injury by shocks, jars, &c.



The governor (as shown) comprehends an internally-threaded tube provided with diaphragms screwed into them, and adapted to be vertically adjusted to vary the distance between them. One of the diaphragms has through it a central tapered opening, in which is fitted a needle-valve, which, by its vertical movement, opens and closes the aperture in which it works more or less to regulate the flow of gas through it. The other diaphragm has also a central opening of sufficient size to supply the burner with gas under the lowest ordinary pressure.

The burner consists of a cylindrical shell provided with a wire-gauze cap held thereon by a flanged ring that fits around the upper portion of the burner-tube or shell; the inturned flange at the top overlapping the edge of the cap. The burner is fitted with a tapered or cone-shaped ring counterbored from the top to provide space for the flanged ring, which rests on, and is sustained by, a shoulder preferably formed by crimping or upsetting the shell of the burner at the base. Immediately above the bunsen tube of the burner is a bell-shaped spreader, formed with a tubular stem, the end of which is secured in a central opening in the gauze cap; while a small tube, screwed into the coupling, rises through the bunsen tube and extends through the tubular stem of the spreader—terminating just above the gauze cap. This tube forms a central jet-burner, receiving gas from the governor through a central opening provided for the purpose in the coupling, and communicating with a corresponding opening in the stopcock.

The means for protecting the mantle from injury by shocks consists of a non-expansible ring or jacket surrounding the upper portion of the burner above the cone-shaped ring, and preferably extending slightly—say, $\frac{1}{8}$ inch—above the burner-tube or shell. The ring may be made of any suitable material having the property of non-expansibility by heat; but is preferably made of prepared asbestos or asbestos cloth, this material serving also as a non-conductor of heat, to prevent the metal of the burner from becoming unduly heated. Also, "by reason of its soft and spongy character, it will, when made of sufficient thickness, take up any expansion of the burner under the influence of heat within."

Automatic Prepayment Mechanism for Controlling the Supply of Electricity or Gas.—Hughes, J., of West Bromwich. No. 11,962; May 26, 1898.

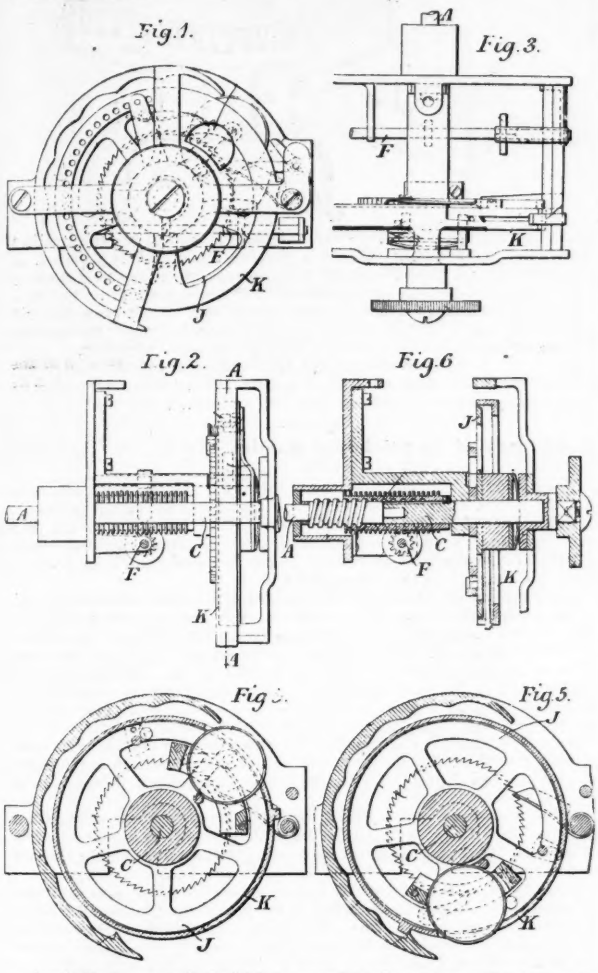
This invention has reference mainly to automatic prepayment switch machines for turning on and (later) turning off or closing the switch, on a predetermined time elapsing after the introduction of a coin. The automatic switch is designed principally for controlling the supply of electric light or gas to billiard tables, by which light is supplied, on the introduction of a coin, for sufficient time to enable a game to be played, and is then automatically turned off, whether the players have finished the game or not.

The necessary apparatus consists of chronometric mechanism, the slotted winder-axis of which is operatively connected to a gapped key-sleeve by the coin inserted. It is confined by means of a rocking stop and a concentric guard, and is provided with a notch or projection which, when the mechanism is wound up, acts in one direction upon an intermediate lever and a stop arm, in order to remove the latter from the path of a governing fly; and after the mechanism has run down to the desired extent, the tooth acts in the other direction to take the stop into

the path of the fly. The electric switch or gas-tap arm has a tooth upon one edge adapted to fall or be impelled into a notch in a rotating disc-wheel on the running down having been completed.

Prepayment Gas-Meters.—Abel, C. D.; a communication from T. T. Somerville, of Christiania, Norway. No. 12,495; June 3, 1898.

The object aimed at by the patentee is "a considerable simplification" in the construction of prepayment meter mechanism, by "greatly reducing the number of working parts, and thereby both diminishing friction and insuring great accuracy of action." For these purposes, the apparatus is constructed as shown in the accompanying engraving. Fig. 1 is a front elevation; fig. 2, a side elevation; fig. 3, a plan; figs. 4 and 5, sections showing the mechanism in two extreme positions; and fig. 6, a transvere section.



A spindle A, one end of which is geared to the meter mechanism so as to be rotated by it when gas is passing, has a screw-thread B formed on i s other end; and the extremity of the spindle is carried in a recess in a second spindle C in line with it. On the spindle C is mounted a screwed sleeve connected therewith by a groove and feather so as to rotate with it, but capable of sliding longitudinally in it. On the outer surface of the sleeve are formed a number of rings constituting a cylindrical toothed rack, with which engages a pinion on a spindle F connected to the inlet-valve of the meter, so that by the longitudinal motion of the sleeve D in one direction it turns the spindle so as to close the inlet-valve, while in the contrary direction it opens the valve. The closing motion is obtained by the rotation of the screw on the spindle A, working in the female screw of the sleeve; the opening, on the other hand, being effected by the second spindle C, which, in being turned, rotates the sleeve so as to cause it to work on the screw-thread of the spindle A. The rotation of the latter spindle is effected by the agency of a coin, as follows: The spindle C has fixed on it a ratchet-wheel with which engages a pawl on a disc J mounted loose on the end of the spindle C. Facing the disc, with a space corresponding to the thickness of the coin between them, is a second disc K connected to one end of a sleeve in line with the spindles A and C, and the other end of which passes to the outside of the meter casing, and there carries a button or hand lever, by which it can be turned.

The action of the mechanism, so far as has been described, is as follows: A coin is introduced through a slot in the casing into the space between the two discs, which space is partly closed by a rim on the second disc. This disc is then rotated by the external button; carrying the coin round with it by means of a pin, until the coin butts against a pin on the first disc. Thereupon this will also be carried round by the agency of the coin; and in carrying round the second spindle by means of its ratchet-wheel, it will cause the rack-sleeve to be slid so as to effect the opening of the gas-valve. When the discs have been turned through a certain angle, limited by a fixed stop, the coin will fall out from between them into a receptacle.

The meter-mechanism being set in motion by the passage of gas through it, the first spindle will now effect the screwing-back of the sleeve, and consequently the closing of the gas-admission valve.

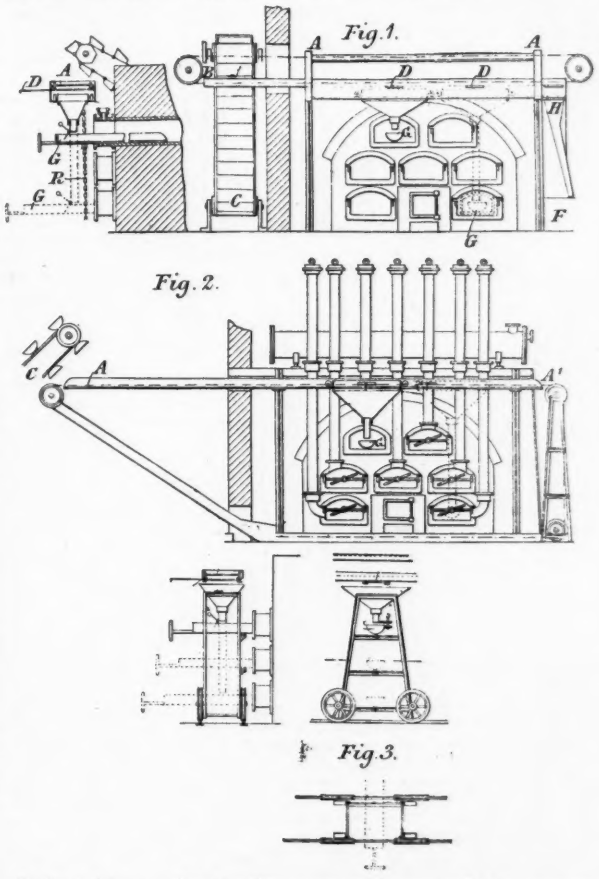
For varying the angle through which the first disc and ratchet-wheel are rotated, and consequently the extent to which the admission-valve is opened (according to the price of gas), the stop on the first disc against which the coin abuts is not fixed, but can be shifted round the periphery of the disc into different positions, so as to cause the coin to begin to operate it sooner or later, as the case may be.

The apparatus being arranged to supply only a certain maximum quantity of gas by the consecutive introduction of a corresponding number of coins, the movement of the apparatus is stopped, when this number has been introduced, by the following arrangement: The valve-actuating spindle has fixed upon it a disc having a notch in its periphery, into which, when the spindle has been rotated to the maximum extent, an arm is made to enter—the arm being on an axis carrying a pawl situated over the periphery of the two coin-discs. When the arm bears against the full periphery of the disc of the valve-actuating spindle, the pawl is raised away from the coin-discs so as not to impede their motion; but when it enters the notch of the disc, the pawl is lowered so as to butt against a projection on the periphery of the outer coin-disc, and prevent it from being brought back into the position in which a coin can be inserted through the coin-slot. As soon as the meter-mechanism begins to rotate the valve-actuating spindle, the angular side of the notch of its disc pushes the arm outward, and thereby raises the pawl so that the coin-discs can be rotated again.

For preventing a coin once inserted between the disc from being removed by a backward turning of the discs, the following device is employed: The periphery of the coin-discs is partly surrounded by a curved guard plate, the inner surface of which is formed with a number of curved notches, on which the coin rests as it is being carried round. The outer spindle, which is actuated by the button, is not rigidly fixed to the outer coin-disc, but is connected to it by a pin on the axis passing through a slotted hole in the disc. Assuming a coin to have been inserted, then for turning the disc in the direction in which the mechanism is actuated by the coin the pin on the spindle butts against one end of the slot; but if it be attempted to turn the disc backward, then the pin on the spindle will bear against the inner part of the periphery of the coin, and in tending to force it outwards from between the discs will jam it against the notched surface of the guard-plate, and thus prevent any backward motion of the discs.

Charging Gas-Retorts.—Abel, C. D.; a communication from the Société Anonyme Continentale pour la Fabrication des Compteurs à Gas, of Paris. No. 12,586; June 4, 1898.

The patentees propose the raising of the coal by an elevator and delivering it on to a conveyor, which leads it along a horizontal trough above the range of retorts and provided with openings over each vertical line of retorts—the openings having slides to close them. On rails under the trough runs a funnel-truck, having a slide to close its bottom opening, and carrying the charging-scoop by chain and pulleys.



In fig. 1, A is an endless travelling conveyor of any suitable construction (which receives the coal at the one end B from a chain bucket-elevator C) working in a fixed casing provided at distances apart corresponding to that of the retorts, with trap-doors D. A hopper E of a capacity corresponding to the charges required runs along angle-iron rails in the casing underneath the conveyor; the discharge opening of the hopper being closed by a pivoted flap. A charging-scoop G is both guided and

supported by a roller on a suspending chain R, while under the discharge opening of the hopper. The hopper serves the double purpose of conducting the coal from the trap-doors D into the charging-scoops G, and also for gauging each charge for the scoop, so that only the exact quantity required is introduced; the discharge into the scoop taking place as this is gradually pushed forward into the retort.

The conveyor receives continuous motion; while the trap-doors D are opened intermittently as may be required. When the charging-hopper has been filled and any trap-door closed, the coal continues to be carried forward by the conveyor to the end of the conveyor, and there discharged into a shoot H, which conducts it into a receptacle on wheels at F, by which it is again run back to the elevator. The speed of the latter is so regulated as to reduce the quantity of this excess of coal supply to a minimum. The scoop is suspended from the hopper by a chain of a differential pulley, so that it can be raised and lowered in order to be brought to the level of whichever retort requires to be charged.

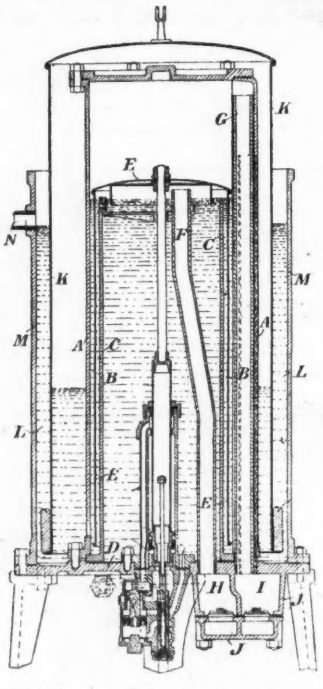
The apparatus can also be arranged to serve at the same time for receiving and conveying away the spent coke discharged from the retorts, as shown in fig. 2. For this purpose, the returning part of the chain conveyor A is arranged to pass downwards at the point A^1 to the level of the floor, so as to receive the coke discharged from the retorts. The conveyor is in this case extended sufficiently beyond the retort-house at the feeding end to allow of the coke being discharged from the lower part while passing up a shoot Z, before receiving a fresh charge of coal from the elevator C.

Instead of supporting the moveable hopper and scoop on rollers running in the casing of the conveyor, they may be mounted on a travelling frame running on rails on the floor of the retort-house, as shown in fig. 3. The frame would be brought successively under each of the trap-doors of the casing of the conveyor for charging the retorts which lie in the same vertical line with the trap-door.

Pumping or Compressing and Mixing Gas and Air.—Keith, J., of Farringdon Avenue, E.C. No. 15,291; July 12, 1898.

This invention is a development of the improvements in gas pumps or compressors described in patent No. 14,057 of 1897; and it has for its object "to simplify and improve the construction of the apparatus, and to adapt it for compressing and mixing gas and air for illuminating and other purposes." An article referring to the arrangement in question appeared in the "JOURNAL" for May 23, p. 1363.

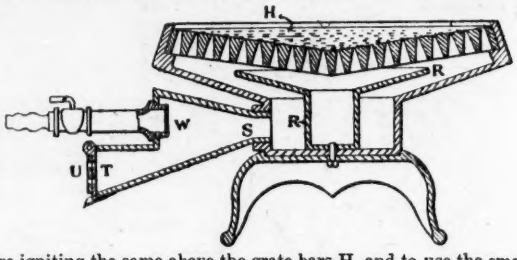
The apparatus comprises a double-acting pump, with a pump-cylinder A provided with an annular water-space B formed between it and an inner open-ended cylinder C secured upon the same base-plate D as the pump-cylinder. Into the water-space a small gasholder E dips. This



holder constitutes the plunger of the pump; the water acting as a seal when the plunger is moved up and down by means of a water-motor such as was described in the patent above referred to, or of the construction described below. The gas to be compressed is alternately drawn in and expelled both above and below the plunger E; the gas being drawn in through pipes F G, communicating one (F) with the interior or lower side, and the other (G) with the exterior or upper end of the plunger. The other end of each of these pipes is connected to an inlet-chamber H I, in a valve-box J connected to the gas supply by an orifice, and provided with valves adapted to open on the suction stroke of the plunger. A second set of valves are adapted to open on the expulsion stroke of the plunger, and permit the gas previously drawn in to be forced into a gas-receiver K, which surrounds the pump portion of the apparatus. This receiver or regulator, which is weighted at the bottom to give the desired pressure to the gas or air contained within it, dips into a water-space L contained between the pump-cylinder and an outer open-ended cylinder or casing M, provided with an overflow N, and is adapted to control a cock on the water supply of the motor by means of a lever (not shown) connected to the receiver and actuated by its rising and falling.

Gas Water-Heaters.—M'Cartney, J., of Oakland, California. No. 20,534; Sept. 28, 1898.

In the stove shown, the inner end of the gas-supply pipe is provided with a perforated tip W (by which the maximum flow of gas is controlled) inserted within the channel S. The cylindrical mixing-chamber is provided with a central standard R, at the top of which is a deflecting hood. Extending between the tip and the mixing-chamber is the channel S, provided with an extension T, flared on approximately the same lines as the channel S. The outer end of it is closed by a gate or damper U, provided with a perforated door pivotally mounted, like the dampers let into the fire-doors of furnaces. The object of thus constructing the stove is "to produce a thorough mixture of gas and atmospheric air,



before igniting the same above the grate-bars H, and to use the smallest quantity of gas possible." For this purpose the door U is provided, as it permits the gas from the tip W to be introduced at the start through the grate-bars, with little or no admixture of atmospheric air. The door is closed when the gas is first ignited; but as soon as the grate-bars are heated, the door is opened, and as the heat becomes stronger the opening is increased until the full volume of atmospheric air is admitted.

By means of this arrangement for controlling the introduction of the atmosphere at the initial ignition of the gas, the patentee claims that he is able to prevent any "striking back" of the flame to the tip W.

Manufacture of Incandescence Mantles.—Voelker, W. L., of New Jersey, U.S.A. No. 25,653; Dec. 5, 1898.

When dealing with the Voelker mantle in the "JOURNAL" for Feb. 14 last (see also p. 510), we were only able to refer to the earlier patents—No. 17,194 of 1896 and Nos. 22,625 and 22,626 of 1897—but stated that there had been a further specification filed, though its contents were not at the time available for notice. It has now been issued, and is numbered and dated as in the above heading.

In the earlier patents there was described, the production of a material termed "magnesium calcite," now known under the name "Voelkerite;" and one feature of the present invention is the employment, for coating an incandescence body or skeleton composed principally of thorium oxide, of an alcoholic solution of the "Voelkerite" or combined oxide of calcium and magnesium, consisting of about 10 per cent. of "Voelkerite" and 90 per cent. of alcohol. Another feature consists in dipping the incandescence body into the solution of light-emitting material with its upper end downward, "so that it will be more thickly coated at or near the top than at or near the base, and will therefore be more durable and less fragile, and capable of emitting a better light than it would be if dipped in the usual way."

Practical experience has shown the following percentage composition of "Voelkerite" to give the best results: 20 per cent. by weight of oxide of calcium, 79⅞ of magnesium, ⅛ of cerium, ⅛ of chromium. The oxides in these proportions are treated as described in the former specifications—that is to say, they are mixed and dissolved in nitric acid, and the solution is then heated as described in the patent No. 22,625 of 1897, and finally electrically fused. The "Voelkerite" thus produced is dissolved in alcohol in the proportion of about 10 per cent. of "Voelkerite" and 90 per cent. of alcohol; and the solution is used for coating a thorium oxide skeleton, as described in patent No. 22,626 of 1897, by dipping it in the solution with its upper end downward. The patentee says he has found that "a better product is obtained when the several oxides constituting the 'Voelkerite' are mixed in or about in the above-named proportions, and the material thus formed is dissolved in the alcohol in the proportions stated. Further, that the strength, elasticity, and durability of the mantle are considerably enhanced by dipping the thorium skeleton in the alcoholic solution upside down, instead of in the usual way." The percentage of "Voelkerite" can also advantageously be increased to about 20 if a higher candle power than usual is required.

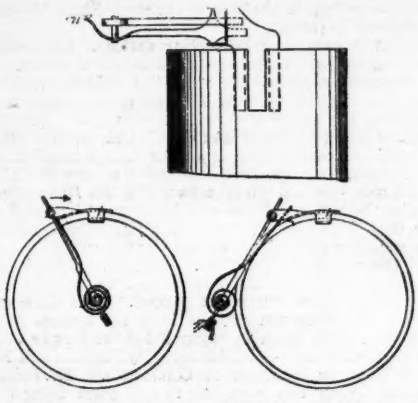
The effect of the dipping upside down is thus described by the patentee: The light-emitting coating which is formed by the "Voelkerite," and which entirely surrounds the thorium skeleton and intimately adheres to it in the same way as the coating on plated metal, increases in thickness from the bottom of the mantle upwards, so that the greater mass thereof is near its top or point of suspension, which always has been the weakest part of the mantle heretofore; and, as the result of this improved method of dipping, a mantle is obtained which is strong but flexible at the bottom, and gradually increasing in strength and rigidity towards the top.

Automatic Gas-Lighters.—Dymond, G. C.; a communication from F. Trendel, of Berlin. No. 5554; March 14, 1899.

This invention relates to the class of automatic gas-lighting apparatus in which platinum-mohr or the "black" of iridium, cadmium, and similar metals, or compounds of such metals is employed—the catalytic quality of the "black" being a well-known means for obtaining the automatic ignition of gas. As usually made, the platinum-mohr and the thin wires of platina connected to it, as also the supporting parts of the platinum-mohr, become worn and inactive in a comparatively short time of use (rendering the apparatus inoperative), principally owing to the fact that the working parts are too much exposed to the heat of the flame which has been lighted. The object of the present invention, therefore, is "to automatically remove the operative platinum-mohr and its supporting parts, as also the thin wires of platinum connected to the blacks, from the heat of the flame as soon as the gas has been ignited, and to cause the blacks and working parts to return into the normal position

when the flame has been extinguished, whereby the apparatus will always be ready for repeated use."

To permit of this being accomplished, the igniting pill is carried by a lever so pivoted to a supporting frame as to normally keep the position directly above the flame to be lighted. But immediately after lighting the flame, the heat generated causes the lever to turn, and so be removed out of reach of the direct heat of the flame. To impart motion to



the lever, a spring composed of two different metals is connected to it; the free end of the spring forming a lever-arm, which, on finding a fulcrum and acting against it, throws the pivoted lever around to a sufficient extent to remove the spring and the platinum-mohr out of the reach of the direct heat of the flame.

The patentee acknowledges that a spring composed of two different metals of different expansibility has been employed before for removing the lighting substance from the flame; but in apparatus of the kind, the spring itself remained exposed to the heat, and within a comparatively short time lost its operativeness. The novel feature of the present invention does not consist in employing a spring of the kind described, but in combining it with a lever which supports the platinum-mohr or similar lighting substance in the peculiar manner referred to, and shown in the engraving—the apparatus being attached to the chimney glass of an argand type of burner.

APPLICATIONS FOR LETTERS PATENT.

10,193.—Main, L. E., "Burners." May 15.
10,238.—Du Bois, E., and The Mutual Electric Trust, Ltd., "Coin-operated mechanism for meters." May 15.
10,248.—Boardman, F. R., "Ignition of gas." May 16.
10,285.—Raden, H. W. van, and D'Espujols, R. L., "Explosion engines." May 16.
10,307.—Mahon, A., "Gas and gasoline engines." May 16.
10,315.—Cramp, A. W., "Periodically interrupting the supply of gas." May 16.
10,335.—Thompson, W. P., "Carburetting apparatus." A communication from The Ransom Gas-Machine Company. May 16.
10,349.—Stevens, W. A., "Gas or oil engines." May 16.
10,358.—Headley, F. H., "Gas-engines." May 17.
10,410.—Mills, C. K., "Generating acetylene gas." A communication from G. Tabard. May 17.
10,439.—Hodder, A. E., and Lester, J. B. G., "Manufacture and distribution of gas for lighting and heating." May 17.
10,488.—Zimer, F. W., "Gas-burners." May 18.
10,506.—Sugg, W. T., "Improvements relating to gas lighting." May 18.
10,510.—Baer, H. C., "Means for giving alarms through the agency of gases." May 18.
10,528-9-10.—Winton, A., "Explosion engines." May 18.
10,546.—Fitzgerald, F. A., "The consumer's gas controller." May 19.
10,561.—Urquhart, R. J., "Electrical igniters for gas-lamps." A communication from Eckel and Glinicke. May 19.
10,582.—Rayet, A., and Doré, G., "Gas motors." May 19.
10,616.—Darby, H. W. & I., and Punchard, J. H., "Circular flame gas-burners." May 19.
10,697.—Le Rond, L. J. J. B., "Rotary engines." May 20.
10,705.—De Léry, J. B., "Incandescent gas-burners." May 23.
10,710.—Allen, T. G., jun., "Acetylene-gas generators." May 23.
10,748.—Powers, J. W., "Generating and storing acetylene gas." May 23.
10,769.—Golby, F. W., "Electrically igniting gas." A communication from La Société Anonyme "Lux Nova." May 23.
10,786.—Schröder, C., "Production of acetylene gas." May 23.
10,834.—Sherwood, H., "Generating acetylene gas." A communication from F. Issels. May 24.
10,845.—Tee, H., "Incandescent gas-lamps." May 24.
10,862.—Saule, P. C., "Generation of acetylene gas." May 24.
10,880.—Muller, E., "Lamp pendants and gasaliers." May 24.
10,976.—Boult, A. J., "Internal combustion motors or engines." A communication from P. Martin. May 25.
10,983.—Stewart-Wallace, J. S., Cowell, W. B., Paisley, J. R., and Welch, J. S. K., "Manufacture of gas." May 25.
11,015.—Schultze, K., "Automatic gas-igniters." May 26.
11,041.—Ernst, E., and Philips, A., "Cleansing acetylene gas." May 26.
11,045.—Widmann, W., "Generators for the production of acetylene gas." May 26.
11,054.—Bowman, F. H., and Dawson, A. R., "Manufacture of calcium carbide." May 26.
11,056.—Fallot, L. A., and Delaunay, E., "Acetylene-gas generators." May 26.
11,116.—Fenderl, E., "Generation of acetylene gas." May 27.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Trading Firms and The Gas Institute.

Sir,—The message from the Council of The Gas Institute regarding "representatives," to which you refer in your issue of the 30th ult., is a step in the right direction. The term, however, is a little ambiguous. Is it the travellers who are alluded to, or are all traders who are not members of the Institute to be excluded? This should be made clear. For instance, I am an extraordinary member; but I have partners who have not that honour. Will they be welcomed as hitherto, or will they be considered "representatives," and be excluded?

Engineer.

June 2, 1899.

Preventing Explosions When Cleaning Dip-Pipes.

Sir,—After reading the account in the last number of the "Journal" of the explosion at the Carlisle Gas-Works on Sunday, the 28th ult., I thought I would venture to offer a little advice on cleaning out dip-pipes and hydraulic mains, being well acquainted with this dangerous work. After gas making has been stopped, and before cleaning out the hydraulic main, see that the dip-pipes have about a 2-inch seal of tar. When a pipe is removed, put a little tar into the main, so as to keep the other dips properly sealed. This will prevent the hot air from the other retorts from passing into the main. Never have a water-seal for the dips, as the water is liable to evaporate and unseal the pipes—a serious consequence. The difficulty attending the cleaning out of the dips and the hydraulic main can be removed, and stopped ascension-pipes prevented, by a method in regard to which I shall be pleased to give further information, free of cost, to anyone communicating with me.

S. Carpenter.

28, *Woodhouse Grove, East Ham, June* 1, 1899.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Belfast Corporation Bill.
Bill read a second time: Gas and Water Orders Confirmation Bill.
Bill read a second time and committed: Gaslight and Coke Company Bill.
Bills read the third time and passed: Cobham Gas Bill, Crowborough District Water Bill, Whitehaven Corporation Bill.

Petitions have been presented against the following Bills: East London Water Bill, Gaslight and Coke Company Bill, Gas Orders Confirmation (No. 2) Bill [Newtown and Farnham Gas Orders], Manchester Corporation (General Powers) Bill, West Middlesex Water Bill.

HOUSE OF COMMONS.

Thursday, June 1.

LONDON WATER (PURCHASE) BILL.

On the order for the second reading of this Bill,

Mr. Stuart said the Royal Commission on the London Water Question had not yet reported; and, as it was quite impossible for the House to arrive at a satisfactory decision until this had been done, he begged to move that the order be read and discharged, and the Bill withdrawn.

Mr. Whitmore said he had a motion on the paper for the direct rejection of the Bill; and he would have been glad if it had been convenient for him to move it, and ask the House to reject the measure on its merits and on grounds of general policy. Under the circumstances, he wished to take formal note of what the honourable member had said—namely, that it would be impossible for the House to come to a satisfactory vote on the second reading of the Bill pending the issue of the report of the Royal Commission. He cordially agreed with this view, but only wished the honourable gentleman and his friends had felt the force of this consideration much earlier in the year. He inferred that the honourable member and his friends would attach great importance to the recommendations of the Commission.

Mr. Bartley pointed out that unfortunately the ratepayers had to pay the cost of the amusement of the London County Council introducing a Bill at enormous expense, and then withdrawing it pending the report of the Commission.

Mr. Duncombe again protested, as a private member, against the deliberate waste of time caused by introducing Private Bills which there was no intention to proceed with.

Mr. Stuart said it must not be understood that he and those with whom he acted would necessarily accept the report of the Commission. He had introduced the Bill in the hope that the Commission would have reported long ago, in which case the measure could have been proceeded with, and a whole year's delay saved.

Mr. Boulnois thought it was a great pity the honourable member for Shoreditch (Mr. Stuart) and his friends on the County Council did not accept the advice of the honourable member for Chelsea (Mr. Whitmore) when he pointed out at a meeting of the Council that it was absurd to bring in the Bill until the Royal Commission had reported.

The motion was then agreed to.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Mid-Kent Gas Bill, South Hants Water Bill, Stockton and Middlesbrough Water Bill.
Lords Bills reported: Arbroath Corporation Gas Bill, Broughty Ferry Gas and Paving Order Bill, Dumbarton Burgh Bill.
Bills read the third time and passed: Belfast Corporation Bill, Cambridge University and Town Gas Bill [Lords], Glastonbury Water Bill [Lords].

Petitions have been presented against the following Bills, brought

from the Lords: Church Stretton Water Bill, Great Yarmouth Water Bill, Leigh-on-Sea Urban District Council Bill, Loughborough Corporation Bill, St. Neots Water Bill, Salford Corporation Bill.

HOUSE OF COMMONS SELECT COMMITTEE.

Friday, June 2.

(*Sir* JAMES RANKIN, *Chairman.*)

THE POWERS OF CHARGE OF THE METROPOLITAN GAS COMPANIES.

The Committee were summoned to resume their inquiry at eleven o'clock; but at mid-day the necessary quorum of five had not been obtained—the only members present being the Chairman, Sir A. Scoble, Mr. Nicol, and Mr. Pirie. Mr. A. C. Morton, who gave evidence at the previous sitting, handed in certain papers, indicating what had been done by the Corporation of London in regard to calling the attention of The Gaslight and Coke Company to the high prices they charged. Contrary to what had been his impression, they showed, he said, that the Corporation had been continually directing the Company's attention to the high price. Mr. Morton was not allowed to make many remarks, and was not examined at all by members of the Committee. The chief witness in attendance was Mr. George Livesey.

Just after twelve o'clock,

The CHAIRMAN, on behalf of the Committee, apologized to the parties for the non-formation of a quorum, and for the valuable time they had had to waste. Owing to the representations which had been made to him with regard to a very valuable witness, he moved—"That this Committee do now adjourn until Friday, the 9th of June, at eleven o'clock."

The Committee formally agreed to the motion; and the inquiry was accordingly adjourned.

THE CONTEST FOR THE DERWENT WATERSHED.

In the "JOURNAL" last week we gave a summarized report of the first portion of the proceedings of the House of Commons Committee, presided over by Sir John Brunner, on the Bills promoted by the Corporations of Derby, Leicester, and Sheffield with the object of improving their water supply by tapping the sources of the River Derwent and some of its tributaries. The evidence now to be dealt with is mainly of an engineering character.

The first witness called to speak on the subject of the works comprised in the Derby scheme was Mr. Charles Hawksley, M.Inst.C.E. He described it as a proper and economical one for utilizing the waters of the Derwent Valley, not only for the supply of the borough of Derby, but for that of the county which was situated in the watershed, and other places below. The total yield from the existing works of the Corporation of Derby was 3¼ million gallons a day after a period of prolonged drought; and the consumption was 3½ million gallons. He calculated that in the year 1951, the quantity of water required daily for the borough would be 9 million gallons, and 7½ million gallons for the rest of the county within the Derwent watershed. The town and county of Nottingham, being also within the watershed, were entitled to a share of the water; and so was Leicester, to the supply of which district there would be no objection, if any surplus were left after Derby and Nottingham had been supplied. The Bill before the Committee would authorize the Local Authorities of Derbyshire to obtain supplies of water from Derby. He estimated that 90 per cent. of the population of the urban districts, and 75 per cent. of the population of the rural districts, would take the water; making the total requirements for the town and county, 16¾ million gallons in the year 1951, or just over half of the 33 million gallons which it was expected to obtain by the scheme. The sinking of additional coal pits made a further supply of water necessary for Nottingham, and he believed that by 1951 the whole of the balance of the 33 million gallons would be required by that county and Leicester. The Derby scheme would involve the construction of six reservoirs at Rowsley, Howden, Derwent, and Bamford on the Derwent, and two on the Ashop, at Woodlands and Ashopton. The drainage area of the reservoirs was 31,946 acres, and the total daily yield about 50,190,000 gallons. The estimated cost of the six reservoirs, which would have a capacity of 8,988,000 gallons, was £4,464,044, for which price he felt confident the works could be constructed. The original estimate, which was made in November was £5,793,305; but since then two reservoirs had been abandoned. Thus far the questions put to witness bore upon the contemplated works. Those which followed dealt with their administration. With regard to the proposal to have a Joint Board, Mr. Hawksley was emphatic in the statement that, according to his experience, it was more desirable to have a single than a combined administration, as Joint Boards were never so harmoniously managed as a single one. The members of the former, having divergent interests, were very liable to differ; and frequently an insufficient supply resulted from the quarrelling which went on among them. His idea had been to utilize all the water of the watershed for the benefit of the people residing in the district belonging to it. The Corporation of Derby had endeavoured to carry out the recommendations of the Duke of Richmond's Commission, which were broadly that a watershed which was naturally and geographically connected with a district should be reserved for that district. If the control of the supply was to be given to a single authority, obviously it was Derby—the first place of any considerable size upon the Derwent; and the Corporation were willing to undertake the risk and responsibility. The estimated cost of managing and working the undertaking in perpetuity, including the rates, would be £1250 a year per million gallons a day. Under the Derby scheme, a supply of water once given to a local authority could never be taken away or curtailed. The witness was next questioned on the details of the Derby and Sheffield schemes, and was asked if the Bill of the Sheffield Corporation contained any obligation upon the promoters to furnish a supply of water to anyone else. He replied that it did not—that they reserved all the water for themselves. The water would all go into Sheffield and other towns in the West Riding. In their petition against the Derby Bill, the Sheffield people stated that their existing sources were sufficient until 1924; and this showed that they were not in immediate want of water. Even allowing ten years for the construction of their works, they should not be in Parliament for another fifteen years. At this point the Chairman asked Mr. Hawksley if he considered Sheffield had no right to come into the Derwent watershed; and he replied: "Certainly, when the water is required for people in the watershed. According to their own showing, Sheffield will not need water for another 25 years."

At this point there was an interesting episode. Mr. Erskine Pollock was about to cross-examine the witness on behalf of the Duke of Norfolk, when the Chairman expressed the hope that Counsel would not be too long. He acknowledged, of course, that the grouse moors would be less valuable during the construction of the works, the amenities of the neighbourhood would be somewhat reduced, and possibly Derwent Hall would be worth less as a residence; but he did not think it worth while to labour these details. Mr. Pollock ventured to submit that the Chairman had not been troubled much on behalf of the Duke of Norfolk, and said that when he had heard the case he thought he would come to the conclusion that it was a very serious matter. The scheme practically meant the complete destruction of his Grace's residence. The Chairman asked Counsel if the Duke was desirous of entirely stopping the construction of the proposed reservoirs; and Mr. Pollock replied: "Certainly, so far as we can see at present." The Chairman thanked him and said: "Unless you can get from the witness that Derby is asking for more water than is required for the supply of Derby and Derbyshire, Leicester and Leicestershire, Nottingham and Nottinghamshire, you will not greatly impress the Committee." Mr. Pollock said they contended that Derby was proposing to take more water than was required for all the districts the Chairman had mentioned. No reply was given to this remark, which brought to a close the proceedings on the first day of the second week of the inquiry.

On the following morning, Mr. Hawksley was cross-examined by Mr. Pember for the Corporation of Nottingham. Witness admitted having heard that the water supply of Nottingham was not in a satisfactory position, and that two years ago they applied to Parliament for power to obtain a fresh supply of water from wells with very qualified success. After Derby and Leicester, no doubt Nottingham, Beeston, and such places, had a claim to the water. But, notwithstanding these needs and rights on the part of Nottingham, he did not believe it would be desirable to have a Joint Board with Derby and Leicester. So far as he was aware, no such proposal had ever been officially made. Here Mr. Vesey Knox interposed, and said the promoters had only that morning heard of the suggestion for the first time; but they would be willing to give the most careful consideration to any proposition which Nottingham might place before them. Mr. Pember then proceeded to press witness further on the question of a Joint Board, describing the attitude of the Derby Corporation as "blood-sucking;" but he was stopped by the Chairman, who said he thought the cross-examination of Mr. Hawksley should be confined to engineering matters. Mr. Freeman followed on behalf of Leicester. He elicited from witness the statement that if the Derby scheme were sanctioned, the first work to be proceeded with immediately would be the Howden reservoir. Ambergate would be the distributing centre of the scheme, and it might perhaps be slightly cheaper to supply a place like Long Eaton from Leicester than from Derby, on account of its closer proximity. It was provided in the Bill under consideration that when two-thirds of the water in the Derwent Valley had been utilized, the remaining one-third should go by right to the town and county of Derby. Witness admitted that the town was 40 miles from the coveted gathering-ground; but, on the other hand, Leicester was 67 miles away. Mr. Freeman remarked that Derby would not be able to supply Leicester under the scheme presented to the Committee; but witness said they certainly would. The Chairman said it was clear that Leicester could not lay the necessary pipes without parliamentary powers; and therefore they need not labour the point. In the course of further cross-examination by Mr. Freeman, witness said that of the amount set down for reservoirs, the estimated cost of the Ronksley reservoir was £188,000; of the Howden reservoir, £354,000; of the Derwent reservoir, £359,000; of the Woodland reservoir, £343,000; of the Asherton reservoir, £304,000; and of the Bamford reservoir, £913,000. The cost of the pipe-lines from Ronksley to Little Eaton would be £439,000; from Howden to Ambergate, £572,000; from Derwent to Little Eaton, £351,000; from Woodland and Asherton to Ambergate, £425,000; and a little line apart, which did not enter directly into the scheme, would cost £7000. To these amounts would have to be added the cost of the land, and all the rest of the expenditure. The Corporation had given an undertaking to the Committee that if hereafter there should be any objection to the charges for water, it should be settled by agreement, or, failing agreement, by an application to Parliament.

After witness had been further cross-examined, the Chairman said something had come to his knowledge which gave him an opportunity of shortening the proceedings. On the previous day, the Nottingham City Council passed the following resolution: "That this Council approves of the resolution of the Water Committee, and hereby authorizes such Committee to agree to such terms, on behalf of this Council, as they may deem advisable in the interests of the city of Nottingham, in order that this city may obtain a full share of the water from the Derwent; and this Council hereby delegates all its powers in relation thereto to the Water Committee." He said the passing of this resolution opened up a prospect to the Committee which was a very happy one; so that there was some chance of an agreement between the parties, or some of them, which would prevent a great deal of argument and evidence. He asked Mr. Pember if he was in a position to take advantage of any Bill or Bills before the Committee. Counsel replied that he was not sure whether, if Nottingham went so far as to undertake a sort of *quasi* promotion of the Bill, it would not be necessary to call a meeting under the Borough Funds Act to authorize their action. But before the next morning he would consider the question, and would then be prepared to answer. Asked if he was in a position to say what was the wish of the Council, Mr. Pember replied that no doubt the Corporation of Nottingham were so anxious to increase their water supply that they were perfectly ready to take a share in the undertaking before the Committee—to bear such an expenditure as might be required for 5 or 6 million gallons, or even more. The Chairman

said that Leicester was desirous of joining in, and Nottingham wished to have its share. He was desirous of having advice as to whether Leicester and Nottingham could get any powers under the Bill as it stood. Mr. Pember said there would have to be some fundamental change in it. The Committee then adjourned until the following day; it being understood that the various parties would, in the meantime, confer as to the possibility of coming to an agreement for a joint scheme.

When the Committee re-assembled the next morning, there was a certain amount of suppressed excitement in the room, in view of what transpired at the close of the previous day's proceedings. When this had settled down, Mr. Pope addressed the Committee in explanation of Leicester's position in the contest going on before them. He said it was not with the Corporation of the borough a mere question of the provision of a supply of water to which other people also had a claim, but one of an urgent and immediate want of a further supply. Leicester therefore would be compelled to press before the attention of Parliament, if possible, some Bill which, during the present session, would enable the Corporation to supplement their supply, or otherwise they would run considerable risk of having their great community short of water. With this view, they looked abroad for a place where their supply could be obtained; and they came to the conclusion that the Derwent area was that place. There was more water there than Leicester would require; and they had always admitted the claim of Derby to a share of the water. The difficulty of the question arose from the existence of two alternatives—either the equitable distribution of the water when obtained, or the division of the area among the rival claimants. The latter plan appeared to Leicester to be an impossible solution. It would be bad economically, and therefore difficult from an economical point of view. It, therefore, came to the question of how the water could be equitably distributed among the various claimants. Leicester had always felt that the proper solution of this question would be to constitute a Joint Board; and their Bill was the only one before the Committee containing clauses which would allow of its establishment on any terms which might be thought equitable and right. Leicester had always been willing to constitute such a Board in connection with Derby. He must not admit any need on the part of Nottingham. He did not believe there was any necessity for Nottingham to claim the Derwent watershed, as she had abundant water of her own; nor had Sheffield any claim, either geographically or by reason of need. In fact, he had himself said not very long ago—of course, with a different object—that Sheffield had an abundant supply for forty or fifty years to come. Nottingham had a geographical claim, but no need; whereas need was the *crux* of Leicester's case. Mr. Pember followed, and acknowledged that he had nothing to say, on behalf of Nottingham, against the views put forward by his learned friend. At the same time he thought Derby and Leicester could hardly be trusted to negotiate and settle in their own minds what the views of Nottingham were. His clients would prefer to have the needs of the town put before the Committee; and no decision would be satisfactory to them unless such a course were taken. Mr. Rickards, as representing the Chesterfield Rural District Council and the Chesterfield Gas and Water Board, endorsed what Mr. Pember had said—that, whatever coalition between the various Corporations whose interests were paramount in this matter took place, those of his clients would be safeguarded. Mr. Ram, on behalf of Derby, said no fault could be found with what had fallen from Mr. Pope or Mr. Pember. He thought the best machinery would be that the Derby Bill should provide for giving to Nottingham such share of the water as the Committee might think she was entitled to; but that there should be a suspensory clause, by means of which she could come next year for what was given to her—Nottingham not having the right, under the present Bill, to secure that. Mr. Baggallay said the position of Sheffield was now, as it had been since they invited joint action eighteen months ago, that there should be union between all the parties represented in the watershed—that, in fact, there should be a Joint Board.

Mr. Hawksley was then recalled, and further cross-examined by Mr. Baggallay. With regard to the proposed Board, he said he believed that in July, 1898, Sheffield invited Derby and Derbyshire to meet Sheffield, Nottingham, Leicester, Barnsley, Rotherham, and Doncaster, with a view to carrying out a comprehensive water scheme; and all along he advised Derby not to be drawn into the snare. He said he thought it was a very wise proceeding on the part of Sheffield—good diplomacy—and if Derby succumbed to the wiles of Sheffield in this matter, the result would be that they would be charged with having admitted that Sheffield had a right to the Derwent watershed. Mr. Baggallay then put this question: "In your opinion now, after what has taken place in this House, are you prepared to say that a Joint Board ought not to be formed, whether Sheffield is included or not?" Witness replied: "I say a Joint Board is, in my opinion, undesirable, and if there is to be one, there should be a Board representing all the interests concerned, and not in partnership with two places for a watershed which is supposed to belong to one only. If it cannot be done by one place, it had better be done jointly rather than not at all." Witness went on to say, in answer to further questions, that he thought a partition of the district would, in this particular case, be as economical as having a Joint Board. He acknowledged that there would be one difficulty about it—viz., that it might mean that the work would have to be carried out for one of the parties long before they required to utilize it to the full, and so they would have capital lying idle, whereas if there were joint action, and two or three bodies could be supplied from the same reservoir, they would not have to the same extent the capital lying idle. This was a consideration to be set against partition. Mr. Baggallay said he hoped he had sufficiently indicated to the Committee what was in the mind of Sheffield as to the right way of dealing with this matter. Mr. Wedderburn, for the Corporation of Rotherham, desired to put in the agreement between that town and Sheffield for the supply of water to the latter place, and to cross-examine Mr. Hawksley as to the needs of Rotherham; but Mr. Ram strongly objected to what was really a part of the Sheffield case being interpolated in the middle of Derby. The Chairman intimated that the Committee would entertain the objection, and that Mr. Wedderburn must content himself with the cross-examination of Mr. Hawksley by Counsel for the Corporation of Sheffield. Mr. Ram then re-examined the witness on certain points raised; and this brought the day's proceedings to a close.

On the re-assembling of the Committee next morning, it was manifest that there was no abatement in the interest felt in the probable outcome of the negotiations in progress between the contending parties; but no indication was given of any approach to an understanding. The re-examination of Mr. Hawksley was continued by Mr. Ram. Witness was first questioned with regard to a point raised by Mr. Baggallay as to the Edale and Burbage reservoirs, which formed part of the Derby scheme as it was first presented to Parliament. Witness said there was very considerable opposition to these reservoirs by the District Council, who were backed up by the County Council. They were very expensive works relatively to the others; and would cost 50 per cent. more. Including interest on capital during construction, exclusive of Edale and Burbage, the cost of the scheme would be about £140,000 per million gallons supplied per diem. But supposing they had to get the supply from Edale and Burbage only, it would cost about £230,000 per million gallons of daily supply—£90,000 more. The embankments would have to be very heavy for impounding water, and catchwaters would have to be made to take the water from a larger area. As to other Authorities sharing in the watershed, he acknowledged that, if Sheffield saw her way to getting a cheaper supply of water for the inhabitants than she could get by going farther afield, she had a perfect right to do so, looking at the matter from a selfish point of view, and disregarding entirely the claims of others. He did not blame the Sheffield people for making the attempt; but he certainly hoped that, after hearing all the evidence, the Committee would not allow them to be successful. When he spoke of Sheffield, of course he meant not that town only, but Rotherham, Doncaster, and other places which Sheffield had taken upon herself to supply. Witness put in a table which had been asked for on behalf of Sheffield, from which it appeared, according to Mr. Hawksley's calculations, that by the year 1936 the entire 33 million gallons available daily would be required for the supply of the borough of Derby within the authorized limits of Derbyshire, within the watersheds of the Derwent and the Trent, exclusive of Chesterfield, Nottingham city, and the authorized limits of supply of Nottinghamshire and the borough of Leicester. In his view—and this was evident from the figures—if Sheffield were to be admitted to a share of the coveted watershed, a large portion of Derbyshire and other places in the valley of the Derwent or the Trent would eventually have to go to Cumberland or elsewhere for their water. In the petition of the Sheffield Corporation against the Derby Bill, it was stated that the available sources of supply would be exhausted in 1923 or 1924. Mr. Baggallay pointed out that this was subject to Sheffield not having a call from Rotherham. Witness said Sheffield was not bound to respond to the call. If she was likely to need water herself shortly, she ought not to undertake to supply others. Mr. Hawksley was next questioned as to the increase of population in the three towns immediately concerned with the Derwent schemes, and he said that to double the population it would take Leicester 28 years, Derby 47½ years, and Sheffield 53 years. Continuing, he remarked that Sheffield had now become very extensive, so that when they got beyond the time of their present resources they would need a large additional supply, and not a small one. Derby must be before Parliament in 14 years' time; and then an opportunity would be afforded of allocating to Sheffield any of the waters which might be regarded as not being needed for Nottinghamshire, Derbyshire, and Leicester. The Chairman observed that this meant that Parliament would revise the whole thing at the end of 15 years. Mr. Ram said the Corporation of Derby were quite willing to assent to the insertion in their Bill of a clause giving Sheffield a free hand to deal with the water left in the watershed at the end of 14 years. Sir George Fardell thought it might have a serious effect in the future if this were established as a precedent. Mr. Balfour Browne characterized the proposal as an absolutely unprecedented one; and he asked the Committee to settle the matter there and then, and not to relegate it to 14 years hence. Mr. Baggallay said his friend Mr. Ram was, in point of fact, asking the Committee to pass the scheme, whether under the control of the Corporation of Derby or under a Joint Board; but the Chairman remarked that this was not the only alternative. He did not wish it to be understood that the Committee desired to tie up the parties either to one alternative or the other. Mr. Baggallay went on to say that, whatever body carried out the scheme, Parliament was to be asked now to sanction one for dealing with the whole of the watershed, excluding the Edale and Burbage reservoirs; leaving it open to Sheffield, at the end of 14 years, to come to Parliament for the purpose of showing that she was in want of water, and ought to have a part taken out of the scheme and given to her. This would mean that Sheffield would have to come and say: "We want a part of the scheme which was passed in its entirety in 1899;" and she would have not only to meet the contention that Parliament had decided that the watershed should be dealt with as one scheme, but also be prejudiced by the fact that the scheme was intended to be carried out by the bodies authorized to do so in 1899. The Committee then retired to consider what course they would adopt.

On the return of the Committee, after an absence of a quarter-of-an-hour, the Chairman said they had decided to adjourn until the following Monday (May 8); and he wished to make a few remarks, on behalf of his colleagues, in order to assist the parties in the meantime. In the first place, it would be difficult to persuade the Committee to grant the exclusive control of the whole of this gathering-ground to any one Authority; and, secondly, they had not expressed any opinion in favour of a Joint Board. What they desired was to leave all the parties before them free to come to any understanding among themselves, either as to a Joint Board or as to a physical division of the gathering-ground. They were of opinion that, in the public interest, and in order to minimize the expense of the protracted inquiry, it would be of the greatest advantage to all concerned if some basis of agreement could be arranged for the consideration of the Committee.

The proceedings were accordingly adjourned.

An indication—slight, but significant—has just been given of the direction which legislation may take in respect of the three schemes whose progress thus far has been recorded. The Committee will resume their sittings to-day; and, in view of the conferences which have been going on during the recess, and the possibility of an arrangement being the outcome, importance attaches to the motion brought forward in the House of Commons by the Chairman (Sir John Brunner) last Friday, asking that the Committee might be empowered, if they thought fit, to consolidate the three Bills before them, "or any part or parts thereof," into one or more Bills. The necessary power was given without discussion.

MISCELLANEOUS NEWS.

AN EXPLOSION AT THE BANKSIDE GAS-WORKS.

Last Thursday afternoon, there was an explosion at the Bankside Works of the South Metropolitan Gas Company; and the occurrence has been unduly magnified by many papers throughout the country, and in some instances wrongly attributed to coal gas. For the following account of what actually happened and the cause, we are indebted to Mr. C. C. Carpenter. It appears that four men were getting a new enricher, of the Clark-Maxim pattern, to work in lieu of one which had previously been in operation. Some difficulty had been experienced in obtaining a proper flow of spirit vapour through the injector; and on the supply-pipe being disconnected, it was found that scale and jointing had got into the nozzle, and partially stopped it. This was cleared out, and the apparatus put together again. The flow was still unsatisfactory; and so it was decided to connect up steam to the vaporizer, and, after emptying it of spirit, to blow through the apparatus, so as to get rid effectually of any scale which might have remained in the connections. The foreman fitter who was in charge was anxious to get on with the alteration; and, as soon as he had the steam connected to the vaporizer, he disconnected the pipe at the injector end in order to give it a good blow through with, as he thought, steam, instead of which, as the vaporizer had not been wholly emptied of oil, petroleum vapour was mingled with the steam. This accumulated in the meter-house; and, a little while after the disconnection had been made, there was sufficient to fire at the jet photometers. The consequence was the windows were blown out and the roof slightly damaged; but beyond this the buildings were not injured. The men who were at work in the meter-house at the time suffered from shock, and from burns about the face and hands; but our latest information, we are pleased to report, is that they are all in a fair way towards recovery.

INDUSTRIAL EXHIBITION AT THE CRYSTAL PALACE.

The South Nave and adjacent corridors at the Crystal Palace are at present occupied by an exhibition representative of the commercial enterprise of the day. It has been promoted by the Article Club; and was opened by the Duke and Duchess of Connaught, amid much ceremony, last Tuesday. The exhibition is unique in this, that there is only one exhibit in any particular branch of industry; and in this respect it follows the distinguishing feature of the Club, which only admits to membership one representative (whose standing must be unquestionable) in any line of manufacture. Consequently there is a great variety of goods; but we cannot say that the best has been made of a grand opportunity. This may be due to the fact that the idea of holding the exhibition was only conceived some five months since, and therefore the preparations have been rather hurriedly carried through. Some of the stands any way had an unfinished appearance last week; and so a visit a little later may alter the impression gained during an inspection on Tuesday last. Messrs. Thomas Glover and Co., Limited, appear to be the only exhibitors having direct relation with the gas industry; and in their particular branch they are worthy representatives. They have on view a good collection of ordinary meters from 500 lights downwards, and a number of prepayment meters; two or three of the latter being partially fitted with glass cases, so that the operation of the mechanism may be inspected. The meter is shown with which the firm took first prizes at the Exhibitions in London in 1862, Dublin in 1865, and Paris in 1867, since which year they have not exhibited for prizes. There is also an interesting model, in a glass case, of the 3000-light dry gas-meter which was fixed by authority of the Royal Commission at the Crystal Palace, in Hyde Park in 1851, to measure all the gas used in the building for lighting, heating, and cooking. Among other examples of the productions of the firm are testholders as made for the City of London Corporation and the London County Council for their testing offices, Mr. Herbert Jones's service cleanser, and lathes. Although in other directions the gas interest is unrepresented, an instructive hour or two may be spent in viewing some of the best productions of other industries; but it must be remembered that the exhibitors are restricted to members of the Club. The exhibition will remain open until the end of October. Readers who visit the exhibition should also take an opportunity of seeing the installation of intensified gas lighting in the corridors of the North Nave, upon which an article appears in another column.

WELSBACH INCANDESCENT GASLIGHT COMPANY, LIMITED.

The Directors' Report.

The report of the Directors of this Company has been issued, in view of the ordinary general meeting to be held next Monday. It covers the period from the date of the formation of the Company—*i.e.*, from Dec. 9, 1897, to March 31, 1899; and it states that the trading and sales have been adversely affected by the premature announcement of the introduction of a new burner, the production of which was unavoidably delayed for some months, owing to the time required to perfect it before it could be issued to the public. Notwithstanding this, the trading for the year ended March 31, 1899, as compared with the previous year, shows an increase in the burners sold equal to 13 per cent., and an increase in the sale of mantles equal to 17 per cent. The net profit, after writing off £6106 for depreciation, and as a reserve for discounts and bad debts, was £249,673, in which is included a dividend on the Austrian shares for a period of nine months only to March 31, 1899, to which date all accounts will in future be made up. Out of this £249,673 interim dividends on the preference and ordinary stocks have been paid, amounting to £102,193, leaving a balance of £147,480, which it is proposed should be applied as follows: In payment of a dividend on the preference stock at 5 per cent. per annum for the half year ended March 31, 1899, £37,500; on the ordinary stock, at 7 per cent. per annum, to March 31, 1899, less amount of interim dividend already paid, £60,750; on the deferred shares, at 7 per cent. per annum, to March 31, 1899, £13,522; placed to the reserve fund, £25,000; preliminary expenses (the whole) written off, £9000; balance carried forward, £1708. The 10,000 £1 shares of the "Era" Incandescent Oil-Lamp Company received in payment for patent rights sold, are not taken credit for in the profit and loss account; and a reserve exists in the balance-sheet equivalent to their par value. Out of the capital originally provided, additional patent rights have been purchased to the amount of £90,000, £80,000 of which represents the sum agreed to be paid for the patent rights of the "Kern" burner for Great Britain and Ireland and the Isle of Man. The remaining £10,000 has been advanced in anticipation of royalties to secure the exclusive licence of the Chalmers' anti-vibration apparatus for Great Britain and Ireland and the Isle of Man. The exclusive licence has been obtained from the Matchless Gas Lighting Syndicate, Limited, for an excellent self-lighting apparatus on a royalty basis, without any capital expenditure. In addition to the Mantle Factory at Palmer Street, Westminster, employing some 400 to 700 workpeople, according to the season, the Board have erected new works at Earlsfield for the manufacture of the new Welsbach burners, street-lamps, and other goods. This new departure, the Directors state, has already been instrumental in reducing the original cost of manufacture. The reports received from Germany, France, and Austria show that the adoption of the Welsbach incandescent gas-light system is on the increase; and there is every prospect of a further steady development in these countries, particularly with regard to street lighting. The city of Vienna will be lighted by the system within the next few months. In England, street lighting with the new burner has also made very satisfactory progress; and the adoption of the system, the Directors say, is bound to increase to a very large degree, since the present installations have proved completely successful. They remark that "most street lighting authorities have now satisfied themselves that electric arc lighting cannot be compared with lighting by incandescent gas; and some corporations supplying both electricity and gas have abandoned the use of arc lamps in the streets in favour of the Welsbach incandescent burners."

THE IMPERIAL CONTINENTAL GAS ASSOCIATION AND THE VIENNA MUNICIPALITY.

A Municipal Scandal.

The Vienna Correspondents of "The Times" and "Standard" have been giving publicity to serious statements in connection with the recent negotiations between the Imperial Continental Gas Association and the Vienna Municipality with reference to the gas supply of the city.

The correspondent of "The Times," writing on the 1st inst., said: An action for libel which will shortly come before one of the Vienna District Courts promises to throw light upon an interesting incident connected with the protracted negotiations between the Vienna Municipality and the Imperial Continental Gas Association—the English Company which provides for the lighting of the Kaiserstadt. This action will turn upon a statement made by Dr. Otto Frischauer, a local lawyer and journalist, in a Court of Justice on Monday last, to the effect that a sum of 600,000fl., or £50,000, had been promised as a commission to members of the anti-Semitic party, in return for their good offices in bringing about a compromise between the Municipality and the Association. It should be remembered that this is supposed to have occurred some two years ago, when the negotiations for the renewal of the contract between the Association and the Corporation had been broken off. The municipal authorities have now issued a *communiqué* intended to show that neither the anti-Semitic majority of the Municipal Council nor any member of that majority appears to be concerned in the affair. This *communiqué* is accompanied by two statements. The first is by a Vienna lawyer who was said to be in possession of the alleged agreement by the Association to pay the £50,000 commission. In this the writer states that he submitted to the legal representative of the Association the proposal to pay the amount mentioned, and that the latter afterwards informed him that it had been accepted. In the particulars given of the manner in which the money was to be divided, it is said that 100,000fl. was to be set aside for a well-known anti-Semitic priest, who was at that time the Editor of a party periodical, by whose influence it was proposed to reopen the negotiations with Dr. Lueger, the anti-Semitic Burgomaster. The statement goes on to say that the writer entered into communication with this priest (whose name, like that of all the other persons concerned, is given in full), secured an interview with Dr. Lueger, and actually re-opened the negotiations, which, however, came to nothing. In consequence of the failure of the negotiations, no commission was paid. The writer adds that he had never mentioned the commission to the anti-Semitic priest, nor had the latter made any demand upon him nor received any payment. He had hinted at the subject in the course of their first interview; but the priest took no notice of his remarks. The second statement accompanying the *communiqué* is by the priest himself. He denies that he received any payment, and even that any allusion was made to a commission. He states, however, that another of the negotiators held out to him the prospect of a commission on the conclusion of an agreement between the Association and the Municipality. He replied that he was guided solely by the interest of the party, and acted without any view to pecuniary recompense. Dr. Otto Frischauer, the author of the original charge and the plaintiff in the pending libel suit, to-day publishes in the "Weiner Tagblatt" what purports to be the text of the undertaking by the legal representative of the Association to pay the 600,000fl. commission. In this document it is expressly provided that 100,000fl. were to be paid to the anti-Semitic priest. Dr. Frischauer says: "The approaching trial will throw light upon this whole affair. It will also include an inquiry into the question of what has become of the sum of 1,000,000fl. which was drawn by the Association from its local banker after the conclusion of the arrangement between itself and the Municipality—that 1,000,000fl. by which the representatives of the Association here reduced the net profits of the English shareholders for last year."

The correspondent of the "Standard," writing on Sunday night, said: The text of a document has been published here, purporting to be signed

by Dr. Leopold Teltscher on behalf of the Imperial Continental Gas Association, promising a commission of 600,000fl., or £50,000, to Dr. Karl Kienboeck, a lawyer in Vienna, subject to payments of 100,000 fl. to an assistant-priest named Joseph Dittrich, and 75,000fl. to one Sigmund Freund, both of Vienna, provided that by their efforts, and especially by the intervention of Dittrich, a settlement was arranged between the Association and the Vienna Town Council. In that event, the document says, the rest of the commission, after the deduction of the two sums specially mentioned, was to be paid either to Dr. Kienboeck alone, or to him and to other persons who contributed to, or were interested in, the settlement between the Association and the town. It has been asserted by a Vienna newspaper that the £50,000 were destined to bribe town councillors to vote for the purchase of the plant and works of the Imperial Continental Gas Association, instead of the town erecting its own gas-works; and the protocols are published of an inquiry instituted by the Burgomaster, Dr. Lueger, in which Dr. Kienboeck states that the £50,000 were destined for Dittrich, and for four Jews, named Tauber, Goldstein, Freund, and Berl, none of whom is a town councillor. Father Dittrich, on his part, declares that the 100,000fl. were offered for a number of articles he wrote in a weekly paper recommending the bargain with the Association. The case will come before the Law Courts in the form of a libel action, brought by a Vienna journalist, Dr. Otto Frischauer, against Dr. Kienboeck. The plaintiff, who is the Editor of the "Weiner Tagblatt," announces that he will on that occasion ask in Court what has become of the sum of 1,000,000fl. which Dr. Teltscher drew from the Vienna banker of the Gas Association, which, he hints, was distributed in Vienna in bribes and commissions. The case recalls the assertion of a well-known English railway contractor that before he was able to do anything in Vienna he had to distribute hundreds of thousands of florins in bribes. Dr. Teltscher, being the plenipotentiary of an English Company, will probably be able to explain to everybody's satisfaction why such a considerable sum was offered as commission on the eve of the discussion of the Company's offer in the Town Council two years ago. The upshot then was that the scheme was rejected, and the building of new gas-works decided upon.

THE REPORT OF THE CHIEF INSPECTOR UNDER THE ALKALI ACTS.

The report for the past year of the Chief Inspector under the Alkali, &c., Works Regulation Acts, 1881 and 1892 (Mr. R. Forbes Carpenter), was issued last week. It opens, as in that for 1897, with an expression of regret that the work of the inspectors was somewhat interrupted by the incidence of illness and accident; Mr. Jackson, who has charge of the South Midland district, having met with a further mishap in May, and Dr. Affleck, who looks after the important centre of chemical industry at Widnes and Runcorn, having been incapacitated from active duty for more than two months. Passing on to deal with the work of the year, Mr. Carpenter says the number of works now registered in England, Ireland, and Wales is 1052, of which only 86 are scheduled as alkali works; the remainder carrying on processes which are scheduled under the Acts of 1881 and 1892. These numbers show a decrease of one alkali and five other works since 1897. There are also 126 works registered in Scotland; bringing the total number up to 1178. Concerning the latter, a separate report is, as usual, presented to Her Majesty's Secretary for Scotland. The number of processes under inspection last year was 1493, compared with 1479 in 1897. In the treatment of gas liquor, 43 processes were employed; and in the manufacture of sulphate of ammonia, 390—being one and eleven respectively more than in 1897. There were 4794 visits paid to works, and 5119 tests made; the figures for 1897 being 4116 and 4562. An old-established firm at Manchester were fined £20 for neglecting to use the "best practicable means" for preventing the escape of noxious gases in the manufacture of sulphate of ammonia, or for rendering them harmless and inoffensive when discharged. A tar company at Bolton were fined £5 for non-registration.

The Chief Inspector refers to the reports of his assistants (to be dealt with in a subsequent issue) as bearing testimony to the vigilance necessary on their part to prevent, or at any rate minimize, the nuisance liable to occur from the operations connected with the distillation of ammoniacal liquor, and with the subsequent neutralization of the evolved vapours or distillate by acid. In his first annual report, Mr. Carpenter dwelt on the importance of so arranging plant for cooling the gases from the saturator that the water condensed should be taken off at the hottest possible point, and so be associated with the minimum of sulphuretted hydrogen and of pyridine. This, of course, serves as condemnation of the method practised in some works of effecting the necessary cooling by an internal spray of water, whereby much sulphuretted hydrogen is liable to be carried away in solution. He points out that if such liquors flow to a town sewer, they become a source of grave danger to the men engaged in keeping the sewers clear. He finds it necessary to again emphasize the importance of this point upon manufacturers and designers of plant for the operations mentioned above. Its observance must, he says, be considered necessary in the case of new works, before they can obtain registration under the Acts; and liability to prosecution under section 9 of the Act of 1881 must ensue if this necessary precaution is disregarded in existing works, except where prescriptive rights to make use of tidal streams may have existence. In works where revivification by downward draught of the oxide of iron in purifiers is used, and where frequent changes of the foul gases to and from the purifiers are made, on the principle of short spells of work in sulphiding the oxide, it has been found in more than one instance that nuisance from the chimney has resulted at the time of change and for a short subsequent period; the gases at the bottom of the purifier and those entangled in the oxide passing away largely unchanged in character. Mr. Carpenter has found it needful in one case—and he says it may be so in others—to interpose a closed supplementary purifier between the change-valve and the chimney, to arrest any sulphuretted hydrogen escaping in this way.

Coming to the portion of the report dealing with the recovery and production of ammonia, the Chief Inspector is able, through the courtesy of manufacturers, to continue the table given for several years past on the production of ammonia from all sources in the United Kingdom. The following figures represent, in terms of sulphate of ammonia, the quantity of ammonia and its salts produced in 1898; and they relate merely to production—not to what is marketable as sulphate:—

	1898. Tons.	1897. Tons.	1896. Tons.
Gas-works	129,590	132,724	127,498
Iron-works	17,935	17,779	16,511
Shale-works	37,264	37,153	37,822
Producer gas, coke, and carbonizing works	11,568	10,624	9,078
Total	196,357	198,280	190,909

Mr. Carpenter points out that, for the first time since these statistics have been given in the reports, a decrease instead of an increase, in comparison with previous years' figures, has to be recorded. To Scotland is due all the ammonia recovered from shale-works, and by far the larger portion of that produced by iron-works; the use of coal in blast-furnaces in England being confined to certain districts in the Midlands. Scotland, however, has only just begun contributing to the recovery of ammonia from coke-ovens. This figure shows a substantial increase, due to the operation of new recovery plants in Durham. Additional plants will shortly start in Durham, Yorkshire, and Lancashire. The effect upon the production of ammonia in gas-works caused by the increase in the proportion of water gas manufactured, in which operation no appreciable amount of ammonia is produced, is beginning to have a marked effect not only in curtailing what has hitherto been looked for as a normal increase year by year, but in converting an increase into a decrease. To this doubtless other factors, such as mild, open winters, with comparative absence of fogs, have contributed. This matter was referred to by Mr. Carpenter two years ago. Alluding to the extensive adoption of carburetted water-gas plant in connection with gas manufacture in many parts of the country, he then said: "The effect of this change will make itself felt more in the course of the next few years; but already the amount of ammonia recovered from gas-works does not show the natural rate of increase corresponding to that of the gas made, as it would if all the latter were derived from coal, instead of being partly due to the interaction of incandescent coke and steam."

The Chief Inspector has continued his examinations into the constitution of ammoniacal liquors, some results of which were given in the two preceding annual reports. Those now published refer to liquors from English sources; but additional results are recorded in his report to the Secretary for Scotland on others obtained from that part of the United Kingdom—the difference in the constitution of the two classes of liquor being commented upon. Only one of the English liquors came from a gas-works; the remainder being from coke-oven plants of various descriptions. Mr. Carpenter says the former, as regards sulphuretted hydrogen, was the most extraordinary liquor that had come under notice; the amount being in the third place of decimals per cent., and only 0·15 per cent. of the total sulphur existed as sulphide. Such a result was totally unexpected, as the coal supply at the gas-works in question was found on inquiry to have been much disorganized owing to failure of the normal supply from South Wales. The conditions were exceptional; and the constitution of this liquor is not very likely to be permanently maintained.

The report closes with some observations on the responsibilities of workmen under the Alkali Acts. In order to assist proprietors and managers of works scheduled under these Acts, especially those operating on a small scale, in impressing upon the workpeople employed therein the responsibilities to which they are subject, the Chief Inspector has suggested that copies of section 25 of the Act of 1881 should be exposed in prominent positions, to indicate the consequences that may ensue from acts of carelessness, disobedience, or wilful neglect on their part. The section alluded to runs as follows:—

> The owner of a work in which an offence under this Act, other than an offence against a special rule, has been proved to have been committed, shall in every case be deemed to have committed the offence, and shall be liable to pay the fine, unless he proves to the satisfaction of the Court before which any proceeding is instituted to recover such fine, that he has used due diligence to comply with, and to enforce the execution of, this Act, and that the offence in question was committed by some agent, servant, or workman, whom he shall charge by name as the actual offender, without his knowledge, consent or connivance; in which case such agent, servant, or workman shall be liable to pay the fine, and proceedings may be taken against him for the recovery thereof, and of the costs of all proceedings which may be taken either against himself or against the owner under this Act: Provided that it shall be lawful for the inspector to proceed in the first instance against the person whom he believes to be the actual offender, without first proceeding against the owner, in any case in which it is made to appear to the satisfaction of such inspector that the owner has used all due diligence to comply with, and to enforce the execution of, this Act, and that the offence has been committed, by the person whom he may charge therewith, without the knowledge, consent, or connivance of the owner, and in contravention of his orders.

Of course, the Act does not in any way require that such a notice should be posted in works. Copies of the section have, however, been supplied to manufacturers who desired it after the matter had been placed before them. In addition to section 25, the Act of 1881 provides (section 20) for the establishment of special rules for the conduct of any manufacture scheduled under the Act as carried on in particular or individual works. Such rules, after submission to, and receiving the sanction of, the Central Authority, become operative as between the owner of the works and his workpeople; and fines in respect of such offences as are indicated in the rules may be recovered summarily.

Following the report of the Chief Inspector are those of the District Inspectors. Mr. Carpenter is desirous of encouraging his assistants to express their own views on the problems which present themselves in the course of their duties; and, with this object, the annual meeting of the staff, established under his predecessor (Mr. A. E. Fletcher), was extended last year to enable adequate discussion to take place. Exchange of experiences in different districts is always of great value, as it often leads to modification of views which may have been based on insufficient data, or to a more correct appreciation of the difficulties surrounding problems urgently calling for solution.

LANCASTER CORPORATION GAS SUPPLY.

The Annual Accounts of the Gas Department.

The accounts of the Gas Department of the Lancaster Corporation for the year ending March 25, have been issued. They are accompanied by a report of the Engineer and Manager (Mr. Charles Armitage), from which we extract the following particulars: The total receipts in the twelve months amounted to £24,476; the expenditure, to £16,581—leaving a gross profit of £7895. After providing for interest on stock and mortgages, £3884, sinking fund, £1604, and income-tax, £259, a net balance of £2148 remains to be transferred to the borough fund. The reserve fund amounts to £12,000—the maximum allowed; and the sinking fund, with interest accrued, to £13,295. Nothing was added to the capital account during the year, but the sum of £1410, the cost of new mains, services, and meters, was charged direct to revenue. The receipts for gas supplied through ordinary meters were £14,910—an increase of £68 on the year 1897-8. Mr. Armitage states that the prepayment meters continue to work most satisfactorily, with a continued demand mostly from new consumers. There had been 925 fixed up to the date of this report, and the receipts for the past year amounted to £1041—an increase of £443. The receipts for public lighting show a further decrease of £47. The following is an analysis of the net cost per 1000 cubic feet of gas sold: Gas, 1s. 3·49d.; interest on stock and mortgages (less interest received), 5·95d.; sinking fund, 2·58d.; borough fund, 3·45d.—total, 2s. 3·47d., the average price received. The average cost of coal is 11s. 7·03d. per ton. Coke contributed in return 4s. 5·2d.; and tar and ammoniacal liquor, 3s. 5·73d. —making a return for residual products of 7s. 10·93d., or 68·29 per cent. of the cost of the coal. Tar products, on the whole, and also sulphate of ammonia, increased in price during the past year. Included in the accounts is a working statement by Mr. Armitage. It furnishes the following particulars: Gas made, 157,546,000 cubic feet; sold to private consumers, 136,702,698 cubic feet; sold for public lighting, 12,450,615 cubic feet; used on works and offices, 1,000,000 cubic feet; unaccounted for, 7,392,687 cubic feet, or 4·69 per cent. There was an increase of 3,187,668 cubic feet, or 2·18 per cent. in the quantity of gas sold during the past year. The capital employed was £132,579, or at the rate of £8 13s. per ton of coal carbonized (13,399 tons of ordinary, 1921 tons of cannel), and 17s. 9d. per 1000 feet of gas sold. Make of gas per ton of coal, 10,283 cubic feet; sale, 9735 cubic feet; do., per cent. on make, 94·68. Coke made, 9957 tons (13 cwt. per ton of coal); do. sold, 8595 tons (86·32 per cent.); do. used as fuel 1362 tons (13·68 per cent.). Tar made, 158,145 gallons, or at the rate of 10·32 gallons per ton of coal. Liquor made, 625,828 gallons, or at the rate of 40·85 gallons per ton of coal. Sulphate of ammonia made, 208 tons, or 30·41 lbs. per ton of coal.

KENDAL CORPORATION GAS AND WATER SUPPLY.

Annual Report.

At the Meeting last Tuesday of the Kendal Town Council, Mr. Alderman Monkhouse, in moving the confirmation of the Gas and Water Committee's report, said that though the accounts had not yet been audited, he was able to announce that the year they had gone through was a record one. In the first place the net profit, after all charges had been made both for sinking fund and interest, was the highest since the undertaking was established. The gross profits exceeded £5000; while at the time the Corporation took the works over they were something like £4000. The quantity of gas produced in 1893 was about 41 million cubic feet; in the past year it was 61 millions—showing that in six years there had been an increase of 50 per cent. Then again, notwithstanding the decrease in the price of gas, which had been reduced by 3d. per 1000 cubic feet, the receipts were £512 more than the previous year. This spoke well for the wisdom of the Council in reducing the price, and bringing gas within reach of people anxious to use it; and he hoped they might be able to see their way to make a further decrease. He was sanguine that if they did so similar results would accrue another year. About £700 had been expended last year in the maintenance of the works, which Mr. Ritson believed in keeping in thoroughly efficient condition; and after paying this and other charges, the net result on the gas undertaking was a profit of £1199, or something like £300 more than in the previous year. This was very satisfactory when they considered that a reduction of 3d. meant a loss of £600. In regard to the Water Department he could not speak so well; but still in ordinary circumstances it would have turned the corner and made a surplus profit after the repayment of principal and interest. But as the Council knew after the late Mr. Bindloss's bequest had been expended, they had to borrow money from the bank, with the result that they had to pay interest amounting to £121. Owing to this, they had a deficiency of £74. The revenue from water had increased very much in the same ratio as for several years past—very steadily. The water-rentals were £3085 against £3037. Taking the two departments together, however, the Corporation must feel contented with the result; and he was sure the ratepayers would also feel satisfied. On the question of a further reduction in the price of gas, he must advise caution in dealing with it, inasmuch as since the last year there had been a great change in the price of coal, which was settled by a ring of coalowners, who had decided not to supply gas-works under an advance of 1s. 6d. per ton. On 6000 tons this would make £450 difference in their expenditure. But if they could see their way to reduce the price of gas, he was sure the results next year would enable him to make a very satisfactory statement, even though the price of coal was increased. The report was adopted.

THE MANAGEMENT OF THE LONGTON GAS-WORKS.

At the Meeting of the Longton Corporation last Thursday, the recommendation of the Gas Committee that Mr. W. Langford, of Bath, be appointed Manager of the works, and Mr. Walter Donaldson, of Longport, the Secretary and Cashier, was confirmed without dissent. The next matter, however, was discussed at some length. It was a proposal that a chartered accountant familiar with gas accounts be engaged to examine the accounts of the gas-works for a period of two years prior to December last, and to report on the system of book-keeping in the department. Further that a member of the Institution of Civil Engineers be engaged to inspect the loose plant and stock, and to present a valuation and report to the Committee. The proposition was opposed by Alderman Bakewell, the Chairman of the Gas Committee, who thought there was no necessity for a special audit, as the books had been regularly audited. In reply to a question as to whether there had been something going on at the works of which the Committee knew nothing, Mr. Bakewell said the books of a certain clerk who recently left had been found to be in a state of great confusion. His books showed that he had overpaid the Committee £36; but on examination it was discovered that he owed the Committee £170. The clerk admitted that his books were in a muddle, and he did not know how he stood. He offered to refund the money. After consulting with the Town Clerk, he (Mr. Bakewell) came to the conclusion that it was not a case for prosecution; and he took it upon himself to accept the money. If they had prosecuted, the town would have lost nearly £100, as the clerk's guarantee was only for £100. Mr. Brookfield said he was much astonished at the action the Chairman was taking in regard to the appointment of a special auditor. When the Committee went through the books, they were in a state of such confusion that they could trace nothing. They found that from some books leaves had been abstracted. Alderman Bakewell: I am not aware of any. Mr. Brookfield: The Chairman had to examine the books, and he said leaves were abstracted. Alderman Bakewell denied this. The carbonizing book was gone; but no leaves were abstracted from the others. Mr. Brookfield: I saw the books myself; the leaves were gone. Alderman Leake said a secretary had just been appointed to take charge of their books; and it would be a mistake if at the suggestion of an auditor they should oblige him to use a system of book-keeping to which he had not been accustomed. If they were not going to do this, he did not see the advantage of having another auditor. Alderman Bakewell thought that, if the audit took place, people would be very much disappointed. It could not bring anything to light. The auditor could not do more than go through the books and tell the Council what was shown by them. An audit of the books would not have shown the deficiency of the clerk to whom reference had been made. His books were perfectly correct. It was his returns that were wrong; and an auditor could not have found that out. After some further discussion, Mr. Chapman moved that the clause, so far as the audit was concerned, be struck out, and that the usual auditors proceed to make an audit of the books of the Gas Department at once. The amendment was carried. The Gas Committee also reported that a letter had been received from a solicitor with reference to certain remarks made in the report of the Sub-Committee respecting Mr. C. Lidgett. The Town Clerk was instructed to defend any proceedings which might be taken.

Mr. W. S. M'Gregor, the retiring Manager and Secretary of the Longton Gas-Works, has written as follows to a local paper: "Councillor Brookfield's statement, made at yesterday's Council meeting, regarding the abstraction of leaves from the carbonizing and other books, is untrue. I may say I have instructed my Solicitor to institute legal proceedings against him; and I trust that the question of privilege may not prevent my having a fair trial."

THE PUBLIC LIGHTING OF NEW HAVEN (CONN.).

We have received from Mr. Henry Hopkins, the Clerk and Inspector to the Committee on Lamps of the Common Council of New Haven (Conn.), a copy of the Committee's report on their work in the thirteen months from Dec. 1, 1897, to Dec. 31, 1898. It is accompanied by one by himself on the progress made in his department, which has under its supervision a district having an area of 8·036 square miles, comprising 150 miles of streets.

According to the Committee's report, the expenses of the department came to $80,993, while the sum appropriated was $81,702; showing an unexpended balance of $709. On Nov. 30, 1897, there were in use 442 electric and 743 gas street-lamps (including plain gas-lamps, Welsbach lamps, and police signal-lamps), and 510 naphtha street-lamps—a total of 1695. During the term covered by the report, there were erected 21 electric lights, 55 gas-lamps, and 11 naphtha-lamps; so that on Dec. 31, 1898, there were burning 463 electric lights, 783 gas-lamps of various styles, and 502 naphtha-lamps—a total of 1748, and a net increase of 53 lamps. There were discontinued during this time 15 gas-lamps, and 19 naphtha-lamps were thrown out of use or changed to gas-lamps; 19 gas-lamps and 37 naphtha-lamps were reset; and 5 changes were made in electric lights. The Committee think it would be advisable to have a more complete set of instruments to test the candle power of the lights. It is their intention to make a thorough canvass of all the streets, to see where improvements can be made. They call the attention of the Council to the improvements made in the department this year, and say it was due to a great extent to the attention of the Lamp Inspector, who also performed the duties of Clerk of the Joint Standing Committee, and assisted them in every shape and form. They ask the Council to consider the advisability of placing all the public lighting in the City under one head, and suggest that they should give this question their serious consideration.

We learn from the report of Mr. Hopkins that the gas street-light division of his department is composed of three classes—Welsbach gas-lamps, plain gas-lamps, and police signal-lamps. This division shows the most marked changes of any—viz., an increase of one police signal-lamp and of 100 Welsbach lamps, and a decrease of 60 plain gas-lamps; giving a net increase of 40 lamps. The Contractors have now about 121 miles of various sized mains laid; and they are rapidly extending the pipes into new territory. The burners in different sections of the city were tested, and in no instance was one found to be below the contract standard—viz., 4 feet. The illuminating power has ranged not less than 18 candles; and in nearly all cases has reached 21 and 22 candles. The nominal candle power of a plain gas-lamp is supposed to be 20, although there is no specified number called for in the contract. The plain gas-lamp fixtures are owned by the Council, with the exception of the burners. In the case of the Welsbach lamps, the posts only belong to them; the

lantern equipments and mantles being furnished and maintained by the Contractors. The candle power is guaranteed to be not less than 60. Mr. Hopkins says these lamps are very popular, and give great satisfaction as an auxiliary to the arc service. The Contractors waived the number of plain gas-lamps to be kept burning; thus enabling the Committee to add 25 Welsbach equipments to plain gas-lamps, and increasing the candle power of the service. The New Haven Gaslight Company are the Contractors; and it is recorded that this branch of the service was never in better condition than it is now. Naphtha-lamps are used in nearly all cases where there are no gas-mains. These lamps show a decrease in number of eight. The city owns the posts, the Contractors the lanterns and equipments; and all reglazing is done without any expense to the Council. The contract calls for 20-candle power. The Sun Vapour Street Light Company, of Canton (Ohio) are the Contractors; and Mr. Hopkins states that if the complaints received during the period of the blizzard were deducted from the list (which they should be in considering the question), the result would prove the most perfect one since the naphtha system was adopted. The contract with the Welsbach Street Lighting Company expired during the year, and the New Haven Gaslight Company were awarded it at a reduction of $1 per lamp per annum; making a saving on the number of lamps now burning of $205 per annum, with an additional burning increase per lamp of 53 hours a year. The price paid for these is $30 a year. The contract for plain gas-lamps and police signal-lamps was given to the New Haven Gaslight Company, at a reduction of 7 c. per lamp per annum, which on the present number of lamps amounts to $40·46, with an increase in burning hours which consumes 123,066 cubic feet more gas—making their cost $22·25 a year. The contract for naphtha-lamps was awarded to the Sun Vapour Street Light Company, at $19·97 per lamp per annum—a saving of $1167·36 a year with increased burning hours. Although the report covers a period of thirteen months, the amount deducted from the lighting bills for lamps not burning was less than in the previous twelve months, even with an increase of lamps in use. The amounts deducted were as follows: From electric lighting bills, $19·71; from gas lighting bills, $19·12; from naphtha lighting bills, $15·13—total, $53·96. This is $4·92 less than the sum named in the last report; showing that the service is of a high order. The following is the nominal candle power of the street-lamps combined: Electric, 555,600; Welsbach gas, 12,300; naphtha, 10,040; plain gas, 11,560; total, 589,500. The outlay of money represented by the fixtures in use (owned by the city) is estimated at about $15,000.

Appended to the reports are a number of tables furnishing financial and other particulars respecting the lighting. Those showing the effects of heat and cold, strong winds, rain, and snow, upon the lighting service are specially interesting. The night of July 3 and the morning of July 4 last year were very hot. At 7.30 p.m. on the first-named day, the thermometer stood at 90° Fahr.; but it gradually fell, until at 3.30 a.m. it registered 81°. Not a single Welsbach, ordinary gas, or naphtha light was affected; as the four gas-lamps which are entered in the table as being "out" were never lighted by the Company. Mr. Hopkins gives this as a proof that extreme heat has no effect on the public lighting service if the fittings are kept in good order. It will be interesting to compare this with what is given in the next table. The night of Jan. 1 and the morning of Jan. 2 were extremely cold. In the afternoon of the 1st, the thermometer registered 5° above zero; by 8.30 p.m. it had gone down to 2°, and from 9.30 p.m. till 2.30 a.m. it stood at 1°. A further drop then took place to 1° below zero; and by 6 a.m. the temperature had fallen another 2°. The first lamps to feel the effect of the cold were a Welsbach and a naphtha, which went out at 10.30 p.m.—an electric light following suit two hours later. Two other naphtha-lamps collapsed about the same time; but not a single ordinary gas-lamp was affected. Of course, on the foregoing occasions there was no wind, the effects of which are shown in the next table. In the afternoon of the 27th of December the wind was very high—its velocity being 30 miles an hour. Two naphtha-lamps felt the effects, and went out. From 5.30 p.m. to 6.30 p.m. the force increased to 35 miles an hour, with the result that a Welsbach and an ordinary gas-lamp were blown out. After this the wind moderated; but early on the following morning an electric lamp failed. High wind and heavy rain told upon the lighting service on the night of the 4th of December and early the next morning. Just at dusk on the 4th, the wind was blowing at the rate of 28 miles an hour, and two Welsbach lights went out. By 6.30 p.m., four ordinary gas and 31 naphtha-lamps were extinguished. Two hours later, and the numbers were 9 and 32. Up to this time it had been raining lightly; but it came on heavily, and continued till 1 a.m.—ceasing half-an-hour later. The heavy rain was accompanied by high wind, which at 11.30 p.m. was blowing at the rate of 45 miles an hour. At this time the lamps out were: 1 electric arc, 3 Welsbachs, 12 ordinary gas, and 37 naphtha. An hour later the wind reached its highest velocity—54 miles an hour; followed by the failure of another electric light and three ordinary gas and six naphtha lamps. By 6.30 a.m. the wind had dropped to 16 miles an hour; but in the meantime, another electric, an ordinary gas, and a naphtha lamp had failed. The electric and Welsbach lights passed best through the ordeal; next came the ordinary gas-lamps; and worst of all the naphtha-lamps, 44 of which were extinguished. Heavy snow and high wind, which prevailed on Nov. 26-27, put out 12 ordinary gas and four Welsbach lights; but only two electric, and a similar number of naphtha lamps were affected. Early in the evening on Jan. 22, 1898, it began to rain, and continued the entire night; something like 1¼ inches falling. The electric lamps weathered the storm; but one ordinary gas and one naphtha lamp, and two Welsbach lamps, were lost, out of 1694 lamps in use. A number of experiments were carried out to test the effect of location on the Welsbach mantles; and the results showed that, apart from accidents to the fittings, the average burning life of the mantles was as follows: At street corners, where there was no vibration from trolley cars or heavy teams continually passing, 550 hours; at corners where these were constantly passing, 431 hours; near steam railroad tracks, 405 hours; in residential streets, 735 hours.

The table giving the expenses of the Lamp Department, &c., from 1889 to 1898 shows that in the first-named year the amount of the appropriation was $65,799, of which $63,096 was expended. In 1892, the appropriation was increased to $72,446, of which $72,287—practically the whole—was laid out. Last year, as already mentioned, the Lamp Committee had $81,702 placed to their credit, and they used $80,993. In the ten years, the amount spent on electric lighting rose from $26,287 to $48,302; the expenses of the gas-lamps falling from $22,944 to $19,538—the last figures in either case being for street lighting only. The expenditure on the naphtha lighting varied but little during this period.

BEVERLEY GAS-WORKS EXTENSION.

Local Government Board Inquiry.

Colonel A. G. Durnford was engaged at Beverley last Wednesday, on behalf of the Local Government Board, in inquiring into an application by the Corporation for permission to borrow £10,000 for gas-works purposes. In stating the case for the Corporation, the Town Clerk gave some interesting details respecting the growth of the works. From 1878 to 1895, the consumption, he said, increased from 34 million cubic feet to 44 millions, which was only what might be termed moderate. Since 1895, however, the increase had been very material, jumping from 44 millions to 56 millions. This was due to the pushing policy followed by the Corporation, who had been greatly helped by Mr. J. Gibson, the Gas Manager. In 1894, on the recommendation of Mr. Gibson, it was decided to put in gas-retorts on Hislop's system, which resulted in an annual saving to the town of £800. In consequence of this, the price of gas was reduced 10d. per 1000 cubic feet; and this was followed by a great increase of consumption—the present amount being 56,798,000 cubic feet. The Corporation adopted automatic gas-meters, gas-stoves, and lent out cottage fittings. At the present time, they had 470 cottage fittings out on hire, and about 200 gas-stoves. In consequence of the great increase of gas consumption, the gas producing plant was found to be altogether inadequate to the requirements of the borough. In winter the maximum amount of gas that could be made in 24 hours was 290,000 feet; and they had only storage capacity for 260,000 feet, or less than a day's supply. The £10,000 which the Corporation were asking for would be expended as follows: £5750 in a variety of engineering works, £575 in Engineer's commission and law expenses, £1500 due to the Borough Treasurer, and £2175 to redeem the land tax, and for the purchase of meters, stoves, and cottage fittings. It was proposed to extend payment of the loan over a period of fifteen years. The Gas Manager then produced plans which he had prepared, and explained the alterations and extensions proposed. There was no opposition to the scheme; and the Inspector at the close of the inquiry paid a visit to the gas-works.

SALES OF STOCKS AND SHARES.

Last Tuesday, Mr. Alfred Richards sold, at the Auction Mart, Tokenhouse Yard, several parcels of gas and water stocks and shares. The first lots offered were 5 per cent. preference shares (£10) in the Caterham Gas Company; and they fetched prices ranging from £12 8s. to £12 10s. per share. Some 4 per cent. perpetual debenture stock of the Tottenham and Edmonton Gas Company was next submitted; and it was disposed of at the rate of £118 per £100 of stock. A parcel of old stock of the Commercial Gas Company, the last dividend on which was at the rate of 13½ per cent. per annum, was purchased at the rate of £317 per £100, with dividend accruing from the commencement of the year. A few fully paid 5 per cent. preference shares in the South-West Suburban Water Company were sold for £13 15s. each, *cum div.* as from March 25. Some fully paid "A" shares (£10), on which 10 per cent. is being paid, in the Horsham Gas Company were purchased for £20 apiece. The last lot offered consisted of seven new ordinary £10 shares (7 per cent.) in the Peterborough Gas Company; and they fetched £15 each. Among recent sales, we may note the following: Mr. Frank Amos sold at Canterbury £1500 of new "A" stock in the Gas and Water Company. It was offered in 150 lots of £10 each, and realized £22 15s., £22 10s., £22 5s., and £22 respectively. Some £10 shares in the Royston Water Company have lately been sold by auction at par. The new issue carries a maximum dividend of 7 per cent., and last year the Company paid 3½ per cent. upon similar shares. Messrs. Spurgeon and Sons recently disposed of some "A" shares in the Maldon Gas Company, Limited (£27, fully paid), at prices ranging from £48 to £48 10s.

ELECTRIC LIGHTING NOTES.

A report is going the round of the papers that a London capitalist has offered to construct at Southend a huge sea wall, at a cost of £600,000. In return, he asks permission to use the tidal force for working a generating plant, with the idea of supplying London with electricity. He guarantees there shall be never less than 3 ft. 6 in. of water on the beach—in fact, that it will be a huge marine lake.

The Finance Committee of the Birmingham County Council, in a report issued last week, recommend that, subject to the passing of the Corporation Bill, now before Parliament, application be made to the Public Works Loan Commissioners for the advance of a loan of £500,000 in December next, for the purchase of the undertaking of the Electric Supply Company, Limited, and other purposes of the Bill. This loan is to bear interest at the rate of 2¾ per cent. per annum, and to be repayable to the Commissioners in 30 years.

At to-day's meeting of the Coventry Town Council, the Electric Light Committee will report upon the working of the undertaking during the past fifteen months. In that time the number of consumers has increased from 100 to 135, and the revenue from £1959 to £3597. The profit on working is only £333, against £106. This, however, would have been substantially greater had not the expenses been swollen by an exceptional item of £333 for repairs and maintenance of mains, as compared with £80 in the preceding year. There are capital charges amounting to £1963; making the net charge on the rates £1629, against £1558. This is not satisfactory trading from a ratepayers' point of view.

The Electrical Committee of the Cardiff Corporation have lately been exercised on the subject of an appointment in their department. An assistant at the electric lighting works had resigned in consequence of

ill-health; and the Engineer (Mr. Applebee) recommended the engagement of a Mr. Ruddock as electrician in his place. But this did not meet with the approval of the Committee; and the Engineer was instructed to see if he had a man in the station whom he could promote, and failing this to secure an engineer. At the last meeting of the Committee it was stated that there was no man who could take on the work, and the credentials and certificates presented on behalf of Mr. Ruddock were exceptionally good. Mr. Fox asked if the Engineer could not promote a fitter in the station. Mr. Applebee replied that there was no fitter competent to take the place. Mr. Fox maintained that a fitter who had been in the works should be able to take charge. On a vessel, he said, a man was termed an engineer, and on shore the same man was a fitter, and worked in shops where they had their own electric lighting. Mr. Applebee pointed out to the worthy councillor that a municipal lighting station was a very complex thing to work, and required a man with electrical training. After much more discussion, Mr. Good proposed that the most competent fitter be promoted. Mr. Brain inquired who was going to take the responsibility. Mr. Applebee said he could not. The Chairman (Mr. W. Evans) said they must as a Committee accept it. Mr. Brain said he would not do so. After going over the whole matter again, Mr. Fox moved that the most experienced fitter be put upon the work for a month on trial under one of the electricians, and this was agreed to.

A report has been presented to the Penzance Corporation by Mr. Frank Latham, the Borough Engineer and Surveyor, on the proposal to establish the electric light in the town. The Corporation have been approached by a company; but Mr. Latham advises that they should undertake the work themselves. He mentions several reasons why he thinks the Corporation can manage the business better than a company, and says "the fact that it is not necessary to work the undertaking at a profit should enable the Corporation to supply electricity with greater efficiency than would be possible in the case of a private company." As to the comparative cost of gas and electric lighting, he says that electricity at 6d. per unit is generally taken to be equivalent to gas at about 5s. per 1000 cubic feet. For street lighting by arc lamps, he calculates that the cost per 2000-candle power would be by electricity 1s. (including carbon renewals, depreciation, &c.), against 2s. 4d. for gas. He recommends that an Order should be obtained applicable to the whole borough, but with a united compulsory area, and that the low-tension continuous-current three-wire system should be adopted. The cost of the installation of a plant equal to 3733 16-candle power lamps he estimates at £21,365, and the cost of maintenance, &c., including interest and depreciation, at £3468 per annum. The annual cost will not be cleared, and a profit made, until the output is equal to 1500 16-candle power lamps; but he is of opinion that the demand will, in a reasonable time, be equivalent to 2000 lamps, when the profit will be £1000 per annum. It is suggested that the charge shall be 10s. per quarter for any quantity up to 20 units, and for each other unit 6d. As to the suggestion that electric lighting should be combined with a refuse destructor, Mr. Latham is not enthusiastic. The net cost of disposing of the town's refuse now is only £128 per annum, while a destructor would cost £5000, and an annual charge of £742. Even if mortar were sold to the value of £54, and £195 were allowed for steam supplied to the electricity works, the cost would still be £364 more than the present system.

THE VALUE OF LAND FOR RESERVOIR PURPOSES.

Arbitration Proceedings.

An arbitration was held at the Westminster Palace Hotel, London, on the 25th and 26th ult., before Mr. J. W. Fair, of Haigh Hall, Wigan, to fix the price to be paid by the Corporation of Harrogate to Sir Henry Ingilby, Bart., in respect of the purchase of a portion of his Haverah Park Estate, near Harrogate, together with certain rights as to easements, &c., needed in connection with the extension of the water supply of the town.

Mr. G. M. Freeman, Q.C., and Mr. Walter Beverley appeared for Sir H. Ingilby; and Mr. Balfour Browne, Q.C., and Mr. Mackenzie represented the Corporation.

Mr. Freeman stated, in opening, that the Haverah Park Estate was 3600 acres in extent, and on account of its proximity to Harrogate was very valuable. It had a fine supply of excellent water, and portions of it had apparently been designed by Nature for the construction of reservoirs; a reservoir being being half formed by the configuration of the ground, while the material was upon the estate for the construction of what remained to be done. The Company who formerly controlled the water had for many years drawn their supply from the estate; and agreements had been entered into under which Sir Henry Ingilby received two rents of £75 and £167 10s. per annum. The notice to treat referred to the acquisition of 65·3 acres of land, and to the acquirement of certain permanent and certain temporary easements. The main value of the land taken was its special adaptability for reservoir purposes, because in addition to its configuration, it was situated at the foot of a gathering ground of 2770 acres, which was only very sparsely populated, and at an elevation of from 650 to 900 feet above sea-level, which was quite ample for all purposes of supply in Harrogate. There were two distinct elements in the question of special adaptability: First, the ground must be physically suitable for reservoir purposes; and, secondly, there must be somebody who wanted it. It followed that it was not sufficient that there should be only one person wanting it in the market, because in this case the value, however good it might be for reservoirs, would be only the value to the one purchaser, and not to the seller. The rule would be clearly laid down that, in estimating the value of anything to be sold, they must not take it as the value to the person who was going to acquire it under certain statutory powers, but as the value which the owner could obtain for it for any purpose for which it was suitable. In so estimating the value, they were entitled to consider that the purchaser would be in the position of one of the competitors if they could show there were other people who would require the property. As a fact, he could prove that considerably more than one person would require it; and that undoubtedly, if Harrogate had not obtained the power to construct reservoirs on the land, they had a valuable asset which would have commanded a good price at the hands of various purchasers requiring it for reservoir purposes. Leeds was getting into a position when they would require more water; and it seemed obvious that this would be a very natural place for Leeds to look to. Otley was only six miles away, and was in want of water; and Ilkley, eight miles distant, was on the point of requiring more water. Various other towns like Wetherby and Knaresborough might also fairly be regarded as competitors. Therefore he had brought himself within the dictum laid down by the Court of Queen's Bench in the famous case of the Countess Ossalinsky (the Thirlmere case), in which, though the owner was the holder of only a small portion of the reservoir site, it was held that, inasmuch as there were other towns that were likely to be competitors with Manchester for the supply, the Countess was entitled to claim the benefit of the special adaptability. In the similar case of the Earl of Abingdon, who was the owner of certain land taken by the Bury Corporation for their new reservoir, though his Lordship was only the owner of one-third of the entire site, it being conveniently situated by the contour of the hills for the purposes of a reservoir, he obtained a very large and satisfactory amount of compensation in respect of the special adaptability of the site. No claim was made here for the water taken, because that already belonged to the Water Authority, subject to the discharge of certain compensation water.

On behalf of Sir Henry Ingilby, a number of witnesses were called, who submitted a joint valuation totalling £27,993. In addition to its adaptability for reservoir purposes, the estate was assumed to have a prospective building value; and among the items were charges of £10 an acre for the area occupied by the open catchwaters, and £5 an acre for the strips of land under which it was proposed to put the mains leading from the catchwaters—all being taken at 36½ years' purchase. The valuation also included an item of £7000 for consequential injury, calculated on the basis that 3500 acres would be damaged to the extent of £2 per acre by the severance caused by cutting one reservoir out of the heart of the estate, by the strips which would be cut out round the other reservoirs, and by 8¾ miles of catchwaters, new roads, &c., by which the estate would be nearly covered. It was admitted that the rents received by Sir Henry Ingilby for the whole of the estate averaged, as a matter of fact, about 8s. 3d. per acre.

Mr. Balfour Browne, on behalf of the Corporation, said there was no special adaptability at all for which Sir Henry was entitled to claim anything; and therefore they had to go to the agricultural value, which was small. Obviously the Corporation already having a reservoir on the estate, it could be useful to no one but Harrogate; for no one could come and put a reservoir on top of them. Special adaptability in the Countess Ossalinsky's case was defined as "the capability of being used for diverting or impounding water, or of being constructed into a reservoir." But in order to make a reservoir, they must have water. Mere conformation of land, without water, was useless to sustain a claim of special adaptability. This point had been held in every case which had come before the Courts. In the case of *Riddell v. Newcastle and Gateshead Water Company*, the arbitrator held that the owner was entitled to nothing for special adaptability on the sole ground that there was a compensation clause giving full compensation water to Mr. Riddell (which was so in the present instance); and this was sustained by the Court of Appeal. In the present case, the Corporation had bought and paid for every drop of water; so that a claim was being advanced for a dry reservoir, which, of course, could not be allowed. The site was shown to be far from ideal, by the fact that so many catchwaters had to be made. Mr. Justice Stephen, in the Ossalinsky case, said: "What I understand special adaptability to mean is that you can make it at a cheap cost." Here, instead of being cheap, the cost would be very heavy. As to probable purchasers of the site of the new reservoir, he affirmed that there were none. Leeds never could take a drop of this water, for while the amount to be gathered was sufficient for a place like Harrogate, it would be infinitesimal for Leeds, in addition to which the cost of tunnelling to get the water to the reservoirs would make it useless to them. Otley had determined to go to the Wharfe; Ilkley could not be supplied, in the high parts at least, from the site; and Wetherby was supplying, or soon would be supplying, itself. Therefore there was no probability of a competitor with Harrogate, and no element of value in the site for reservoir purposes. As to the claim for depreciation, Counsel contended that the estate, as a whole, would practically suffer no depreciation beyond that caused by the existing works, for which annual payments amounting to £242 10s. 0d. were already being made to Sir Henry Ingilby.

Evidence was then taken from a number of witnesses in support of Mr. Balfour Browne's statement. They said that the land of Haverah Park was, to a large extent, wet and boggy; that it possessed practically no building value; that the stone on the land was unsuitable for waterworks purposes; and that there was no sand and little (if any) clay. Only agricultural value attached to the land. It was shown that the new reservoir, for work alone, would cost not less than £60,000; and its capacity would be 200 million gallons. The cost per million gallons stored would therefore be £300, which was not cheap. Valuations, on the basis that the land possessed nothing but agricultural value, were put in varying from £3803 to £3656, which sums in each instance included an allowance of 10 per cent. for compulsory sale.

The Arbitrator reserved his award.

Public Lighting by Acetylene.—Last Thursday evening, the hamlet of St. Michael's, Tenterden, was illuminated for the first time with acetylene gas.

Labour Trouble at the Darlington Gas-Works.—An old labour trouble has arisen at the Darlington Gas-Works. According to the report to hand, one of the men employed at the works, named Ainsley, who has been engaged there about twenty years, refuses to become a member of the Gas Workers' Union. The other employees, who are members, refuse to work with a non-unionist, and demand that he should be discharged or compelled to join their Union. The Corporation Gas Committee have no wish to force Ainsley to take the latter step. Alderman Barron, the Chairman of the Gas Committee, on Friday had an interview with the men at the gas-works, and pointed out the unreasonableness of their conduct.

THE MECHANICAL FILTRATION OF WATER.

The "Engineering Record" recently devoted an article to the experiments which have been carried out with the mechanical filters of the Louisville Water Company by Mr. C. Hermany and Mr. G. W. Fuller—the former being the Company's Chief Engineer, and the latter their Chief Chemist. The results have been published in great detail in Mr. Fuller's report to the Company; and they throw a flood of light on the hitherto little-understood subject of American high-speed filtration with preliminary coagulation. The data hitherto available were practically confined to the report of Mr. E. G. Weston, on experiments at Providence, and that of Mr. Allen Hazen, of his five weeks' investigations for the Ohio State Board of Health of the Jewell filters at Lorain, which were so favourable to high-speed filtration that the more elaborate results of the Louisville experiments (made upon the Ohio River water, which was very difficult to treat) have been eagerly awaited. Our contemporary could not afford space for an adequate review of all the valuable data in the book; but the main facts established by the investigations were summarized. The leading one is that mechanical filtration, well conducted, is shown to be a manifest success.

The experiments were begun in October, 1895, with Jewell and Warren filters, and in December with two Western filters, and daily tests were made until August, 1896. The greater part of that month was spent in the investigation of electrical systems of purification, and the three following months were devoted to a compilation and study of the results. December was given mainly to a study of the corrosive action of the purified water on boilers and pipes, and its scaling properties. Further investigations of electrolytic devices occupied the early part of 1897; and the remainder of the year, to October, was mainly spent on investigations of devices designed by the Company's officers and the preparation of the report, though a few weeks' tests of a polarite filter were made during this time.

The Ohio River water changes widely and rapidly in character, on account of the remarkable flood and draught fluctuations of the stream. At no time was it free from suspended matter, which varied in amount from 1 to 5311 parts per million by weight. Sometimes the particles were comparatively large, but occasionally they were less than 0·00001 inch in diameter—smaller than bacteria, in fact—and could be removed only with great difficulty. During the low stages of the river, the water is comparatively clear; but its hygienic character is least satisfactory. Unmistakable signs of sewage contamination were repeatedly detected, although all tests for specific germs of disease gave negative results. There is enough dissolved carbonic acid and oxygen gases in the water to cause considerable corrosion of uncoated iron pipes; and for use in steam-boilers the water holds a rank between the soft and clear waters of the East and the hard supplies of the West.

The investigations of 1895-6 proved conclusively that the method of purification embodying subsidence, coagulation, and filtration is most economical in treating the Ohio River water for use in Louisville. The use of coagulants is imperatively demanded during six to ten weeks in the spring and early summer, when fine silt is carried by the river. The data collected in 1897 showed that the efficiency of plain subsidence depends very largely, so far as any particular period is concerned, upon the conditions under which it takes place. Mr. Fuller concludes that, with given conditions, it is possible to remove economically in this way about three-fourths of the suspended matter in normal muddy water. During freshets, nine-tenths might be removed; and during low water, one-half or even less. The removal of bacteria by plain sedimentation follows the removal of suspended matter in a general way; but the matter is not important, because the subsequent filtration effects the same purpose without extra cost. During the freshets all the evidence goes to indicate that plain subsidence cannot economically remove a sufficient amount of the fine clay to prepare the water satisfactorily for filtration. By March, 1897, it was known that the absence of suitable settling-basins in which sedimentation could be carried to its economical limit during periods of muddy water in the river, caused one of the experimental filters to become so clogged that it was unable to purify enough water to allow it to be washed properly; and in the case of the best filters, lack of settling-basins would make it necessary to provide reserve filters with an area of about three-fourths of those in ordinary service. The same omission of facilities for sedimentation would also make it necessary at times to waste one-fourth of the water filtered in order to wash the sand beds. Other defects are referred to as follows in the report: "It was demonstrated conclusively that, owing to the very frequent and marked changes in the composition of the water in the river, it was difficult to give to the systems of purification suitable attention to guard against, on the one hand, an imperfectly purified effluent, and, on the other, an unnecessarily large application of coagulating chemicals, with its needless increase in the cost of chemicals, and in certain objectionable results in consequence thereof. With a proper employment of subsidence, it would be much easier to operate a large system of purification satisfactorily, independent of the consideration of a large and needless reserve portion of the system."

The information in the report relating to the character, use, and effects of coagulants is particularly valuable. It was learned that the amount of coagulant necessary to remove suspended matter varied widely with the size of the particles—increasing as their size decreased. It was also found that different kinds of suspended matter dispose of varying amounts of coagulant by an action which is called absorption for want of a better name. This is most marked in the case of clay, and appears to be largely a chemical action. Hence, with the ordinary conditions of the river water, the first portions of the coagulant have a low efficiency; and after a certain amount has been applied, a very small additional quantity causes complete coagulation, provided sufficient time is allowed to elapse after the application of the chemical.

A very important result of this part of the studies is summed up in the following words: "Owing to the fact that with the commercial sulphates (coagulants) the respective hydrates are formed almost instantaneously, the presence of coarse particles which subside quickly causes a waste of chemicals in amounts equal to the quantities of original chemical absorbed, *plus* a certain amount of hydrate which becomes attached to their surfaces. The attached hydrate is thus removed before it coagulates to its full power the fine particles in the water. The above facts are decisive proof that it is impracticable to apply coagulants to a water which contains suspended matter which may be economically removed by plain subsidence."

So far as the time of adding the coagulant is concerned, it was found that after the water had been partly clarified by the subsidence of the coarse suspended matter, it required, for its most economical and efficient treatment, different periods of coagulation at different times, according to the character and amount of suspended matter. When the chemicals are added at two places, two objects are sought—the coagulation of the suspended particles, and their removal by sedimentation. "While it is probable that sedimentation might take place more rapidly if the coagulation were completed before the suspended matters began to subside than when these two actions took place simultaneously, experience indicates quite clearly that a saving is made by allowing sedimentation to take place during coagulation. The period of coagulation, being plainly the shorter, becomes therefore unimportant, as the optimum period of subsidence with coagulation would be the controlling factor. The conditions of these investigations were not such as to allow the study of the optimum period of subsidence with coagulation, of a water which had already been partially purified by plain subsidence. It may be stated, however, that as the water, after proper preliminary treatment by plain subsidence, would contain only relatively fine suspended particles, the optimum period would probably be considerably longer than would be indicated by the results of subsidence with coagulation of a water which had not been properly settled." The amount of coagulant to be added varies widely on account of the great fluctuations in the amount of suspended matter in the river, already mentioned; but it was found that, under ordinary circumstances, the water would rarely, if ever, reach a condition where it would be safe to add, for each gallon, less than 0·75 grain of sulphate of alumina, containing about 9·87 per cent. of aluminum.

It is evident from what has been stated that proper coagulation is imperative in the Ohio River water, but to determine what may be the proper degree, it is necessary to know what amount of suspended matter can be handled by mechanical filters. On this head, the report says: "Much thought has been directed to an expression of this amount by weight in parts per million. We have not succeeded, however, in fixing the limit in this manner, owing to the wide discrepancies obtained in handling equal weights of suspended matter of different character. Thus at times 100 parts per million of fine clay were more difficult to remove than 500 parts of silt. The best way in which we can express this amount is by the statement that by plain subsidence, aided by coagulation when necessary, the suspended matter in this river water should be reduced to a point where, by filtration and the coagulation just preceding it, the remaining suspended matter can be removed by the final application of coagulants not exceeding 1·5 to 2 grains per gallon of ordinary sulphate of alumina or its equivalent."

All the experiments showed that when the amount of coagulant is such as to give at the normal rate of filtration only a moderately satisfactory bacterial efficiency, a reduction of the rate by one-half does not increase that efficiency, although it slightly lengthens the period between washings of the sand. In Mr. Fuller's judgment, it was advisable to construct a plant at Louisville on the basis of 100 million gallons per acre daily, with the knowledge that in all probability the rate could be safely increased to a considerable degree. The sand he advises using has an effective size of about 0·35 millimetre and a depth of 30 inches; and he recommends a total filtering head of about 10 feet.

The effluent from a system of purification works using sedimentation, coagulation, and high-speed filtration, has, in the case of the Ohio River water, a greater corroding action on uncoated iron pipes or receptacles than the raw supply. The number of incrusting constituents in the effluent, which cause trouble in boilers, is also greater; but it is possible that the removal of sediment from the water would more than balance its increased hardness.

The sand layer in the filters should be washed thoroughly with filtered water, and accompanying agitation of the sand layer is an advantage. Surface agitation could be employed profitably to a greater degree than was the case in any of the experimental filters. "In practice, the filter-tank should be designed so as to allow the water above the sand, together with the surface accumulations, to be flushed off into the sewer during agitation." The occasional use of caustic soda to keep the sand clean is considered advisable.

The degree and kind of attention required by such a system of water purification is, of course, an important subject, and if the experiments yielded nothing more than the information obtained on this head, they would have compensated the Company for the expense of the investigation. The report states: "The impression which some people have that large systems of water purification by this method will at all times yield an effluent of satisfactory character with merely nominal attendance, is wholly incorrect so far as the Ohio River water is concerned. In the first place, both efficiency and economy require that very close attention be given to the application of chemicals. Setting aside the question of cost, any excess of the chemical above the optimum is attended with increased amounts of corroding and incrusting constituents in the filtered water, and, under unskilled supervision, chemical in excess of the amount which the water will decompose might be added at times—resulting, of course, in the inadmissible presence of undecomposed chemical in the effluent. On the other hand, a reduction of the amount of chemical by a small percentage below the optimum would cause immediate deterioration in the character of the effluent—a deterioration which at times could not be determined for several days, as in the case of the Ohio River water a clear effluent is not necessarily a pure effluent, especially during the winter months."

The daily cost of the sulphate of alumina required in the operation of a 25-million gallon purification system ranges from $21 to $678, according to the character of the river water. It is easy to see, therefore, how the cost of operation could be run up by attendants without the training or ability to change the dose of coagulant to suit the water. Moreover, the amount of water they would waste in washing the filters would add materially to the daily expense and diminish the capacity of the works; so that, from whatever point the subject is approached, it is seen that, in the case of a water like that at Louisville, skilled attendance is necessary, not only for obtaining the best quality of effluent, but also for economical operation.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The accounts of the Perth Gas Commission for the year ending April 30 last have been made up and submitted to a meeting in Committee. They show a most satisfactory state of matters, and bear out the view that any difficulties which the Commissioners may have had have not arisen out of the management of the works, but out of the policy adopted by the Commissioners themselves. The receipts amounted to £24,496, an increase of about £1500 upon the previous year. Of the gross receipts, £21,194 was derived from the sale of gas, as against £19,643; the price of gas remaining the same (3s. 2d. per 1000 cubic feet). The revenue from gas alone is thus £1551 more. The rental derived from gas-stoves was £214, as compared with £138. The expenditure amounted to £18,165—leaving a gross surplus of £6331. The increase of expenditure over the previous year was £456. Of the gross expenditure, £10,821 was for coal and oil, as against £9476; an increase upon this item alone of £345. Salaries and wages cost £4458, or a decrease of £548; and rates and taxes cost £966, or a decrease of £246. The year began with a balance carried forward of £301, which raises the gross surplus to £6632. Out of this the following provisions have to be made: Annuities, £2812; interest on debts, £1134; sinking funds, £1329; and contingency and depreciation funds, £500—together £5775. This leaves a sum of £857 to be carried forward. The sinking fund account has been increased during the year from £1924 to £2776. The general balance account shows assets amounting to £135,631, as against £127,593 a year ago. The whole debt of the Commission in respect of money borrowed, is £36,000, which includes £12,500 borrowed under the Act of 1898. The depreciation of works fund amounts to £3511. The expenditure connected with the new works at Friarton has been: Cost of Act, £2036; and expended on works, £7694. It is anticipated that there will be no change in the price of gas. Thus, through storm and stress, Mr. Wilson has brought his ship safe into port, with flying colours, at the close of another voyage.

The gas accounts of the Dundee Corporation for the year ending April 30 have also been issued. They come out with a decided improvement upon the previous year; but the finances of the Commission are in a somewhat unsatisfactory position—there being a large interest account, and a heavy sinking fund contribution, which swallow up revenue. As there is an increase of £7000 in the price of coal during the current year, and it is estimated that £4000 will be expended out of revenue upon extensions of the gas-works, the Gas Committee are under the necessity of recommending that the price of gas be raised from 3s. 2d. to 3s. 4d. per 1000 cubic feet. The quantity of gas delivered from the works was 605,311,500 cubic feet, or 49,311,500 feet over the estimate. The amount sold was 550,495,150 cubic feet, or 32,445,150 feet over the estimate, and 41,623,450 feet over the quantity sold in the previous year. It was also 102,383,650 cubic feet over the quantity sold in 1895. The total revenue last year was £90,055, or £5176 over the estimate, and £5743 more than the revenue in the previous year. The revenue from gas was £87,490; but from this sum there falls to be deducted £3876 of discount and bad debts, leaving the net revenue of the year from gas at £83,614. The quantity of gas delivered was in excess of that of any previous year. The revenue from chemical products was £5465, a decrease of £35 upon the estimate. Coke realized £482, or an increase of £232. The year began with a balance against it of £314, including which sum the total expenditure was £87,048, or £2185 over the estimate and £2421 over the actual expenditure of the previous year. The cost of coal was £44,729, purifying materials £1522, main and service pipe repairs £1797, gas apparatus, tools, &c., £1623, retorts and settings £2024, meter repairs £2340, interest £6192, annuities £7068, assessments £4747, salaries £2814, coal analysis £408, sinking fund £7500, and contingent fund £500. The sinking fund now amounts to a sum of £66,042. The capital account shows expended a year ago £224,933, and during the year £8887—raising the account to £233,820. The gas-stove account showed an expenditure of £4347, receipts £1434, and a balance outstanding of £2913. During the year, the amount received for the hire of stoves, fittings, &c., was £324. The balance of profit upon the year's working, which was estimated at the low figure of £15, was £3007. Unaccounted-for gas rose from 7·42 to 8·102 per cent. It is estimated that in the current year there will be an output of 620 million cubic feet, of which 564,650,000 cubic feet will be sold, yielding £94,392, or, deducting discounts and bad debts, £90,252. Chemical products are estimated to produce £8200, and coke £2500. The total revenue is estimated at £104,109. The expenditure is estimated at £103,541, of which £55,641 is for coal and wages of firemen; and, as stated above, £4000 is suspense account for reconstruction of gas-works. The estimated surplus is £569.

The continued prosperity of the Glasgow Corporation Gas Department and the great improvement which has taken place in the residual market during the past year, are shown in the fact that the revenue from the sale of gas down till nearly the end of May was £451,685, as against £420,812 in the previous year (an increase of £30,873), and that the revenue from residuals has been £147,393, as against £108,869 (an increase of £38,524). These two sums of £30,873 and £38,524, though not by any means all profit, will make a wonderful difference to the annual balance-sheet, and more particularly so when it is considered that under contract prices, raw materials have been obtained cheap.

The new arrangements as to pay, &c., of the workmen at the Glasgow Gas-Works will mean, it is said, an additional expenditure of between £9000 and £10,000 per annum.

At Hamilton everything connected with the gas-works is so lovely that, unless the Corporation kept a recognized, almost official, opposition, who spend their time searching for mare's nests, and thereby provide subjects for them to occupy their minds upon, the members of the Corporation would be apt to come to the resolution that life is not worth living. The arrangement does not work badly for the gas undertaking as a rule, because it is well known to be the most successfully conducted one in Scotland. Still the system has been known to break down, and to lead to unpleasant things being said, which is not helpful to the spirit of trust and cordiality which ought to animate municipal life, as well as society generally. One of these incidents occurred this week. The real business on the gas minutes was passed over in a word or two; and the attention of the meeting was directed to an altogether profitless and withal paltry matter of detail with regard to the method of paying the men in the gas

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1480.

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 13	10½	Alliance & Dublin 10 p. c.	21½—22½	..	4 13 4
100,000	10	,,	7½	Do. 7 p. c.	15½—16½	..	4 10 11
800,000	100	Jan. 3	5	Australian 5 p. c. Deb. .	104—106	..	4 14 4
300,000	5	May 12	6	Bombay, Ltd. . . .	6½—7	..	4 5 9
40,000	5	,,	6	Do. New, £4 paid .	4½—5	..	4 16 0
880,000	Stk.	Feb. 24	12	Brentford Consolidated	275—280	..	4 5 9
240,000	,,	,,	9	Do. New . . .	215—220	..	4 1 10
50,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0
159,375	,,	Dec. 15	4	Do. 4 p. c. Deb. .	128—133	..	3 0 2
220,000	Stk.	Mar. 29	11½	Brighton & Hove Orig. .	265—270	..	4 5 2
226,320	,,	,,	8½	Do. A. Ord. Stk. .	194—197	..	4 6 4
973,500	Stk.	Feb. 24	5	Bristol, 5 p. c. max. .	125—130	..	3 16 11
420,000	20	Mar. 29	10	British	47—49	..	4 1 8
50,000	10	Feb. 24	12	Bromley, Ord. 10 p. c. .	25—27	..	4 8 11
75,000	10	,,	9	Do. 7 p. c. . . .	20—22	..	4 1 10
500,000	10	Apl. 27	6	Buenos Ayres (New) Ltd.	10½—11	..	5 9 1
220,000	Stk.	Dec. 30	4	Do. 4 p. c. Deb. .	103—105	..	3 16 2
150,000	20	Mar. 10	8½	Cagliari, Ltd. . . .	28—29	..	5 13 10
100,000	10	June 1	7	Cape Town & Dis., Ltd.	13—14*	..	4 16 7
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	56—58	..	5 3 5
550,000	Stk.	Apl. 13	13½	Commercial Old Stock .	312—317	..	4 5 2
200,750	,,	,,	10½	Do. New do. .	245—250	..	4 4 0
200,750	,,	Dec. 15	4½	Do. 4½ p.c. Deb. .	145—150	..	3 0 0
800,000	Stk.	Dec. 15	10	Continental Union, Ltd.	195—200	−15	5 0 0
200,000	,,	,,	7	Do. 7 p. c. Pref. .	188—193	..	3 12 6
51,600	Stk	Feb. 24	14	Croydon A 10 p. c. . .	—	—	—
168,400	,,	,,	11	Do. B 7 p. c. . .	—	—	—
555,000	Stk.	Feb. 24	5½	Crystal Palace Ord. 5 p.c.	133—138	+3	3 16 2
60,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0
486,090	10	Jan. 27	11	European, Ltd. . . .	23—24	..	4 11 8
364,060	10	,,	11	Do. £7 10s. paid .	17—18	..	4 11 9
14,993,075	Stk.	Feb. 10	4%	Gas-light and Coke	4 p. c. Ord. . .	112—114	−1	4 7 8
2,600,000	,,	,,	3½		3½ p. c. max. . .	101—103	..	3 6 0
3,799,735	,,	,,	4		4 p. c. Con. Pref.	127—129	−1	3 2 0
3,843,975	,,	—	—		3 p. c. Con. Deb.	101—103	..	—
70,000	10	May 31	8	Hongkong & China, Ltd.	13¼—14¾	−½	5 9 6
3,800,000	Stk.	May 12	10	Imperial Continental .	225—230	..	4 7 0
473,600	Stk.	Feb. 10	3½	Do. 3½ p. c. Deb. Red.	102—105	..	3 6 8
75,000	5	Nov. 30	6	Malta & Medn., Ltd. .	5—5½	..	5 9 1
560,000	100	Apl. 4	5	Met. of	5 p. c. Deb.	113—114	+1	4 7 9
250,000	100	,,	4½	Melbourne	4½ p. c. Deb.	110—112	..	4 0 4
541,920	20	May 31	5	Monte Video, Ltd. . .		13—14*	+1½	7 2 11
617,946	Stk.	Feb. 24	9½	Newc'tle & Gateah'd Con.		228—233	..	3 19 5
264,855	Stk.	Dec. 30	3½	Do. 3½ p. c. Deb. .		107—110	..	3 3 8
				* Ex div.			

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	May 31	8	Oriental, Ltd. . . .	7½—8*	..	5 0 0
135,000	5	,,	8	Do. New, £4 10s. pd.	6½—7*	..	5 14 3
15,000	5	,,	8	Do. do. 1879, £1 pd.	1½—13*	..	4 11 5
60,000	5	Mar. 29	7	Ottoman, Ltd. . . .	5—5½	..	6 7 4
500,000	100	Dec. 1	6	People's Gas of Chicago	2nd Mtg. Bonds .	102—106	..	5 13 2
851,070	10	Apl. 27	7	River Plate Ord. . . .		11½—12	..	5 16 8
250,000	Stk.	Dec. 30	4	Do. 4 p. c. Deb. .		103—105	..	3 16 2
250,000	10	Mar. 29	10	San Paulo, Ltd. . . .		16½—17½	..	5 14 3
135,000	Stk.	Mar. 29	10	Sheffield A.		237—240	..	4 3 4
209,053	,,	,,	10	Do. B.		237—240	..	4 3 4
447,427	,,	,,	10	Do. C.		237—240	..	4 3 4
5,600,000	Stk.	Feb. 10	5⅓	South Metrop., 4 p.c. Ord.		140—142	..	3 15 1
1,460,000	,,	Jan. 13	3	Do. 3 p. c. Deb. . .		101—103	..	2 18 3
—	—	—	—	Tottenham and Edmonton	A. .	—	—	—
—	—	—	—		B. .	—	—	—
182,380	10	Dec. 30	5	Tuscan, Ltd.		9—10	..	5 0 0
149,900	10	Jan. 3	5	Do. 5 p. c. Deb. Red.		99—101	..	4 19 0
				WATER COMPANIES.			
746,184	Stk.	Dec. 30	11	Chelsea, Ord.		318—323	..	3 8 1
150,000	,,	,,	5	Do. 5 p. c. Pref. .		168—173	..	2 17 10
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75		150—155	..	2 18 1
175,785	,,	Mar. 29	4½	Do. 4½ p. c. Deb. .		155—160	..	2 16 3
1,720,560	Stk.	Apl. 13	7	East London, Ord. . .		220—224	+2	3 2 6
654,740	,,	Dec. 30	4½	Do. 4½ p. c. Deb. .		157—160	..	2 16 3
390,000	,,	,,	3	Do. 3 p. c. Deb. .		102—104	..	2 17 8
700,000	50	Dec. 15	7½	Grand Junction	10 p. c. max. .	113—116	..	3 4 7
310,000	Stk.	Mar. 29	4		4 p. c. Deb. .	135—140	..	2 17 2
708,000	Stk.	Feb. 10	14	Kent		360—365	..	3 16 9
160,000	,,	,,	7	Do. New, 7 p. c. max. .		210—215	..	3 5 1
1,043,800	100	Dec. 30	10½	Lambeth, 10 p. c. max. .		303—308	+3	3 7 11
406,200	100	,,	8	Do. 7½ p. c. max. .		230—235	..	3 8 1
850,000	Stk.	Mar. 29	4	Do. 4 p. c. Deb. .		135—140	..	2 17 2
500,000	100	Feb. 11	13¾	New River, New Shares		433—438	..	3 2 9
1,000,000	Stk.	Jan. 27	4	Do. 4 p. c. Deb. .		137—142	..	2 16 8
902,300	Stk.	June 29	7½	South-wark and Vauxhall	Ord. . . .	215—220	..	3 8 2
136,500	100	,,	7½		7½ p. c. max. .	197—202	..	3 14 3
489,200	Stk.	,,	5		5 p. c. Pref. .	168—171	..	2 18 6
1,019,585	,,	Apl. 13	4		4 p. c. A Deb.	135—140	..	2 17 2
1,155,066	Stk.	Dec. 15	10	West Middlesex . . .		302—307	..	3 5 2
200,000	,,	,,	4½	Do. 4½ p. c. Deb. .		157—160	..	2 16 3
200,000	,,	Mar. 10	3	Do. 3 p. c. Deb. .		102—104	..	2 17 8

works. I can hardly follow it; but it seems to have been the view of the official opposition that the men should sign paysheets, and that at the instigation of Mr. Ewing, the Manager, the men objected, on the grounds that the day shift had sometimes to wait for an hour or so, in a heated condition, upon the convenience of the Town Chamberlain's clerks, while, on the other hand, night-shift men had to get out of their beds and go to the works to secure their pay. It looks like a mere matter of detail; but it provided sufficient diversion, and consequently a war game on a grand scale had to be organized. The result of it, however, was that the Committee carried the day by eight votes to six; and, so far as I can understand it, the payment of the men is retained in the hands of the Gas Manager's staff, and is not to be transferred to the Chamberlain. So much delectation was got out of this encounter, that it has been resolved to have another on an early date. There is the objection of some coterminous proprietors to the erection of sulphate works to be considered; but this would not be sufficient for an evening's entertainment, and accordingly a question as to who is, or is to be, foreman in the gas-works has been thrown in. The fixture is to be in the works, and the whole Town Council are to be present; so that a battle-royal may be expected.

I have treated this matter in a light vein, for the subjects are in themselves too trifling to be dealt with seriously; but there is a serious side to even trifling questions, if they are persisted in. The pin-prick policy directed against this country is a sufficient illustration of this. Messrs. Tainsh and Keith have been effectually put out this time, and no harm has apparently been done; but a time may come when they may wound feelings, and something unpleasant may happen. It is a surprise to me that they cannot see how magnificently managed their gas undertaking is. Almost the only real business before the meeting was a recommendation by Mr. Ewing that the price of gas should, for the forthcoming year, be reduced by 2½d. per 1000 cubic feet. It is at present 2s. 1d., and would thus have been decreased to 1s. 10½d. per 1000 cubic feet. This is a figure which no other body in Scotland can approach. Mr. Ewing was confident that the reduction could have been made (even with a rise in the price of coal of 43·75d. per ton), and a surplus of about £200 has been realized on the year's working; but the Gas Committee, in view of the fact that they have not yet contracted for all the coal they will require, have thought it better to leave the price of gas at the low figure at which it has been for the past few years. The Council homologated the view of the Committee. Even this is a great deal, because in most places the price of gas is being advanced. There are people who do not know when they are well off, and undoubtedly Messrs. Tainsh and Keith belong to this class.

Before I leave this subject, I may as well deal with an incident in the Edinburgh and Leith Gas Commission, of the same class, which took place at their meeting on Monday. There the only business of importance was the minutes of the Works Committee, which contained the very satisfactory announcement that there had been an increased output of gas for the previous month of 6 million cubic feet, as compared with the corresponding month of last year. There was no difficulty about the adoption of the minutes; but Mr. Kinnaird, of Leith, raised several objections as to the *agenda* paper, the recent inspection of the Granton site, and the quality of the gas. The two first items are altogether beneath notice; and as to the third, Mr. Kinnaird did not say the gas was of inferior quality, he only put the question whether the Engineer was attending to the quality of the gas, in order, apparently, to allow him to make the stab, under cover of it, that he could not see how the Engineer could be looking after the quality of the gas when he was attending deputations. Lord Provost Mitchell Thomson assured Mr. Kinnaird that Mr. Herring was giving attention to the matter; and he added that he did not think that Mr. Kinnaird had the sympathy of a single member of the Commission. I thoroughly endorse the latter statement; and I am glad that it is so, because Mr. Kinnaird's aspersions are altogether uncalled for. If these outbreaks did not occur so often, they would not be worth taking notice of. The aggravating feature of them is that in Committee Mr. Kinnaird is very much as other people. He takes no exception until he gets into public meetings; and then his tongue loosens, and the insinuations fly. Such conduct is not an assistance to business, but is rather the reverse.

The Dumfries Gas Commission benefited so much last year by the sale and hire of gas fires and cookers, that the output of gas rose by 7,140,000 cubic feet. Since May 15, it has continued to rise at the rate of 10 per cent. per annum. The Commissioners this week entered into contracts for the supply of coal during the current year. The total is 8154 tons, at an average price of 17s. 6d. per ton delivered. Last year the quantity contracted for was 7730 tons, at an average price of 15s. 1d. per ton. They have estimated, modestly, for an increased output of 2 million cubic feet of gas; and so the apparent increase of £1198 in the cost of coal is reduced to £1016. The Commissioners use the Peebles oil process. They have this year contracted for 300 tons of oil at £3 6s. 3d. per ton. The price is slightly higher than it was last year; but the rise has not been so great as it has been in coal. The consequence is that by using more oil the cost of gas production would be cheapened. I do not know what policy the Gas Commissioners propose to follow; but it is gratifying to know that they do not consider it necessary to raise the price of gas.

Paisley is another place from which it is announced that there is not likely to be any increase in the price of gas. The Secretary for Scotland has approved of the application of the Corporation for increased borrowing powers to the extent of £25,000, for extensions of the works. It was anticipated that the cost of the extensions, and charges on account of the electric light undertaking, would likely lead to an increase in the price of gas, which is at present 2s. 6d. per 1000 cubic feet for gas of 27·22-candle power; but it is now believed that it will be possible to go on without raising the price.

A paragraph appeared in a Dundee newspaper on Tuesday which, though it does not indicate where the incident occurred, I take to refer to Dundee itself. It is headed "The Dangers of Gas-Stoves," and narrates how a baby who was 28 days old was placed in a cradle near a gas-stove, the fumes from which the child inhaled, and died; and that a medical gentleman had pronounced death to be due to poisoning from carbonic oxide. If it was carbonic oxide poisoning, there must have been an escape of gas, and the case is one of ordinary coal-gas poisoning, due to

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BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY WORKS, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.,	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE	150,000

AND ADDITIONAL WORK.

either an accidental leak or carelessness; but the paragraph speaks of fumes from the stove, which, in common language, is usually intended to mean the products of combustion. In this case, would not the cause of death be the inhalation of acetylene gas? There are some stoves which, if the burners are not attended to, do throw off acetylene at times. Whichever way it was, the case is one which should be inquired into further, because, if it be allowed to stand that even an infant may be poisoned in places where there are gas-stoves, a check will be placed upon the use of these articles, which, I am sure, is unwarranted. The Dundee Gas Commission should have the subject investigated.

In Alloa this week two subterranean gas explosions took place. A large escape of gas from the main was being searched for by workmen. They dug a hole in the street, and applied a lighted torch to it. The gas had found its way into the common sewer, and exploded. The pavement was disturbed for a short distance, and showers of water from the traps were thrown out of the street gratings. The same thing happened on two days running; the reason, on the second day, being supposed to have been a spark caused by a pick striking a stone.

The Elgin Town Council on Monday resolved, by the casting vote of the Chairman, to combine the offices of Gas and Water Manager, as they were in the person of the late Mr. Taylor. The names of four applicants for the post were submitted to the meeting. It was resolved not to make any appointment that night, but to select one gentleman who would be asked to come to Elgin to be interviewed. The one selected was Mr. Macpherson, assistant in the Aberdeen Gas-Works.

The appointment of Mr. A. Smith, jun., to the post of Manager of the Airdrie Gaslight Company having been announced, an ultra-smart Glasgow newspaper commented, in what appeared to me to be a sneering fashion, upon "a Birmingham man" having secured the appointment. This was the result of writing without knowledge. There could be no greater mistake than to speak of Mr. Smith as a Birmingham man. The blunder was all the greater when it is known that he was for years in the Glasgow Corporation Gas Department, and has been for a very short while indeed in Birmingham. The practice of pitting Glasgow against the whole world is one which this particular Glasgow newspaper very frequently indulges in. It is a silly practice. If a real Birmingham born and bred man had been found to be the best for the post, he would not only have been entitled to get it, but the Directors of the Airdrie Gas Company would have been guilty of dereliction of duty if they had not given it to him. The selection of Mr. Smith in this instance is another finger-post, pointing to the fact that the qualifications which are necessary in a gas manager are now very different from what they used to be. The field of work is wider; and the requirements are more exacting. The mere manufacture of gas is not the only thing he has to attend to now. There must be a scientific training, to enable the manager to deal with the chemical and engineering sides of his work; and the more complete technical training he has, especially in engineering, the better it will be for him. That Mr. Smith possesses all these qualifications in a high degree, everyone who knows him will readily admit. In fact, he possesses them so markedly that it will be a wonder if he be allowed to remain very long at Airdrie.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June* 3.

Sulphate of Ammonia.—The market has been quiet all through the week, and prices have eased off; the closing quotations being £12 10s. to £12 12s. 6d. per ton f.o.b. Hull and Liverpool. In Scotland, makers quote £12 17s. 6d. per ton f.o.b. Leith; but re-sales have been made at less money. Requirements for May having with difficulty been covered, buyers are in no hurry at the present high range of values in regard to June contracts, hoping by waiting to find a better opportunity. Actual business done has consequently been on a very small scale. Producers have, on their part, been under no pressure to sell, having no stocks; production being nearly at its minimum, and the larger makes being already pretty fully sold for June. The reduced prices accepted have therefore been mainly for second-hand parcels. In the forward position, makers have maintained a firm attitude; but interest has disappeared, and bear quotations abroad fail to draw buyers.

Nitrate of Soda is fairly steady at 8s. per cwt. for fine quality on spot.

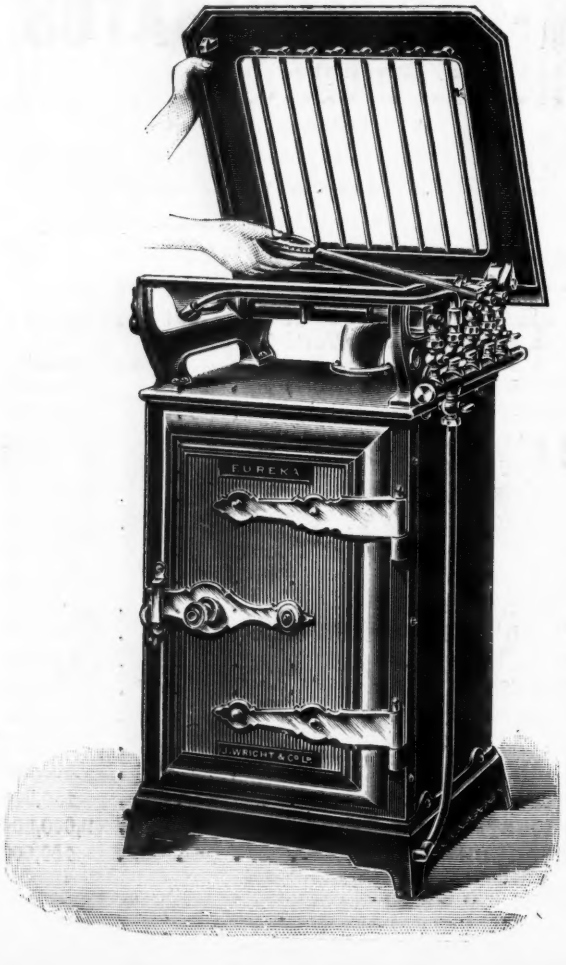
LONDON, *June* 3.

Tar Products.—A comparatively dull market prevails. No business of striking importance has transpired. Makers of pitch are hopeful of the future; but fuel makers, on the other hand, declare they cannot afford to pay the high prices mentioned, if they are to compete with coal. There is no relief to the depressed condition of benzol, a large line of which, it is reported, was sold at 5½d. in this market. It will probably be naked value. Creosote continues firm, with active deliveries on old contracts. Solvent naphtha is a little more inquired for; but buyers are trying to purchase under the market quotation. Carbolic acid is in fair request, with a tendency to better prices. No business in anthracene is mentioned; and it continues weak.

The week's values may be averaged as follows: Tar, 15s. to 23s. 6d., position and quality regulating the value. Pitch, east coast, 27s.; west coast, 24s. 6d. Benzols, 90's, 6¾d.; 50's, 7¼d. Toluol, 9d. Solvent naphtha, 10d. Heavy naphtha, 11½d. Crude, 30 per cent., naphtha, 3d. Creosote, 3¾d. Heavy oils, 65s. Carbolic acid, 60's, 2s. 1d.; 75's, 2s. 7½d. Creosote salts, 42s. 6d. Anthracene, nominal, "A," 3½d., "B," 2½d.

Sulphate of Ammonia.—Interested dealers quote this market easier; and a conspiracy undoubtedly exists to put prices down. Fortunately, few makers have any sulphate to sell, being well contracted; and the production just now is light, and will continue so for some months. Business has been done at as low as £12 10s., less 3½ per cent.; but makers are asking at least 5s. more for June delivery.

The Directors of C. & W. Walker, Limited, met at the Grand Hotel, Birmingham, on Monday last week, to consider the applications for shares; and on the following Thursday the letters of allotment and regret were posted. The Company have just secured the contract for the erection of a four-lift gasholder at the Wallasey Gas-Works. The price is £15,800.



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WITHOUT
ANY OF THE DISADVANTAGES.

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JOHN WRIGHT & CO.
LIMITED,
LONDON & BIRMINGHAM.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Exceptional activity has characterized the gas coal trade; and contracts generally have been settled much more promptly than has been usual in previous seasons, while another noticeable feature is that gas companies and corporations are buying in larger quantities. Ordinarily it has been the practice to contract for amounts slightly below full requirements, and to take the chance in the open market, after the close of the winter, to buy any further quantities that might be required to carry gas-works on until the renewal contracts were placed. This year, however, when gas companies and corporations came upon the market to purchase these extra quantities beyond their contract deliveries, they found they had to pay advances of 1s. 6d. to 2s. per ton over their current contract prices; and, evidently as a result of this experience, it has generally been thought advisable to settle contracts for the full requirements over the ensuing twelve months. As already intimated, there has also been considerably less hesitation about settling with regard to the new contracts, which in previous years have sometimes hung over for a month or six weeks, pending tests and other investigations, before any definite decision has been come to. Most of the Lancashire collieries report that they have already closed for the bulk of the contracts which they usually accept at this time of the year; and in all cases it is said they have had no difficulty in securing the advance of 1s. 6d. per ton over the average contract prices of last year, with here and there an advance of 2s. where specially low rates were taken in 1898. As to the average prices quoted by the principal collieries on contracts that have already been settled, 9s. per ton may be taken as the general basis for ordinary screened Wigan four-feet gas coals, with 9s. 3d. secured in isolated cases upon small contracts; while for best Wigan Arley gas coals the basis prices range from 9s. 6d. up to 10s. per ton according to the special character of the contract. In the general trade, the recent holiday stoppages of the pits, with the consequent temporary restriction of the output, have for the time being caused some shortness of supplies; but there is a decided slackening off in requirements for house-fire purposes, and the better qualities of round coal are becoming rather more plentiful on the market, with merchants here and there pressing for some concessions where they have new business to place. Generally, however, collieries are holding firmly to their full list quotations, which remain at 12s. to 12s. 6d. per ton at the pit for best Wigan Arley, 10s. 6d. to 11s. for Pemberton four-feet and seconds Arley, and 9s. 6d. to 10s. for common house coal. Common round coals are in brisk inland demand at 9s. per ton at the pit; but for shipment there is only a moderate inquiry, and 9s. 6d. per ton continues to be taken for common steam coal delivered at the Garston Docks, with 10s. about the average figure at the High Level, Liverpool, and 10s. 3d. and 10s. 6d. at the Partington tips of the Manchester Ship Canal. Most of the principal Lancashire collieries are still short of supplies of engine fuel; but there are fairly large quantities coming in from other districts, and there is no actual scarcity of slack on the market. Prices, however, remain firm at 6s. 6d. to 6s. 9d. per ton at the pit for best sorts, 5s. 6d. to 5s. 9d. for medium, and 5s. 3d. to 5s. 6d. for common slack. With regard to coke, the scarcity in the production to meet the present large requirements for iron-making and foundry purposes, continues to force up prices.

Northern Coal Trade.—Trade has continued active; the full demand for export having been experienced. Best Northumbrian steam coals are steady at from 12s. 3d. to 12s. 6d. per ton f.o.b.; and steam smalls are 5s. 9d. to 6s. There is a steady demand for gas coals, for though the local consumption is now at about the minimum point for the year, there are larger exports; and prices are well maintained. The completion of the chief local contracts has been effected at prices varying from 8s. 6d. to 9s. per ton f.o.b.; and there is a belief that these rates reflect the highest prices likely to be obtained for such contracts at the present time, though for the richest Durham gas coals it is probable that there may be higher figures asked. For occasional cargoes, the price of gas coals is unaltered. Gas coke is steady; but as the local output is mainly sold on long contracts, the price does not greatly vary from week to week.

Scotch Coal Trade.—Business is easier. There is a difficulty in getting away all the coal which is being got, which is said to be due to a scarcity of shipping. The home demand is strong; but the weakness of the export trade is sending coal into the market at home in such quantities that the prices for some sorts are a shade easier. Forward contracting is not favoured by coalowners beyond the end of July, as there is an expectation of an advance of prices in the autumn. The rates quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 9s. 9d. to 10s. 6d., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 183,578 tons—an increase of 3658 tons on the previous week, but a decrease of 36,337 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,219,105 tons—a decrease of 193,439 tons upon the same period of last year.

New Joint-Stock Companies.—The Annan Gas Company, Limited, has been registered with a capital of £10,000, in £1 shares, to acquire and carry on the undertaking of the Annan Gas Company, Limited. The Saltcoats Gas Company, Limited, has been registered with a capital of £16,000, in £1 shares, to adopt an agreement with the Saltcoats Gaslight Company, or the Liquidators thereof, and to manufacture gas and electricity. The Ingleton Gas Company, Limited, has been registered with a capital of £4000, in £1 shares, to acquire the business carried on by the Ingleton Gas Company in the town of that name, and also at Thornton-in-Lonsdale, in the West Riding of Yorkshire. The "Gasorcoal" Stove Company, Limited, with a capital of £12,000, in £1 shares, will acquire, develop, and turn to account certain patents, inventions, and rights. Two of the objects of the Electro-Metallurgical Company, Limited, who will take over the Elmore and other Companies, and work them with a capital of £700,000, in £1 shares, are to carry on the general business of an electric light and power Company, and to produce and supply gas.

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SLOT COOKERS.

UP-TO-DATE CONSTRUCTION.

Farnham Gas-Works Purchase Question.—The Farnham Gas Company have absolutely declined an offer of the District Council to purchase their undertaking. The Council have, in consequence, decided to ask the ratepayers to declare whether or not they shall proceed with the proposed purchase.

Increase in the Price of Gas at Cullingworth.—The Directors of the Cullingworth Gas Company have sent out notices to the effect that from the 1st of July the price of gas will be advanced from 3s. 4d. to 3s. 7d., and for cooking purposes from 2s. 10d. to 3s. 1d. per 1000 cubic feet, subject to the usual discount.

Suggested Abolition of Water Gas at Birkenhead.—At to-morrow's meeting of the Birkenhead Town Council, Mr. T. Cook will move that, "in view of the report of the Departmental Committee on Water Gas, and the general dissatisfaction existing in Birkenhead, it is undesirable to continue the further use of this gas."

Coventry Corporation Water Accounts.—In their annual report, the Water Committee of the Coventry Town Council announce that the receipts amounted to £10,594, against £10,545 in the preceding year. The balance of revenue over working expenses is £4508, and the net profit £2796. From accumulated profits the Committee recommend that £3000 be appropriated in aid of the borough rate.

Reductions in Price.—As from the 1st prox., the price of gas at Ross will be reduced to the District Council and the usual quarterly consumers to 3s. 9d. per 1000 cubic feet. The Tipton District Council have reduced the price of gas to small consumers from 2s. 10d. to 2s. 9d., and to large consumers from 2s. 8d. to 2s. 6d. per 1000 cubic feet. The Gas Committee of the Bury Corporation have reduced the price of gas by 2d. per 1000 cubic feet.

The Southampton Corporation and the Local Water Bills.—At a special meeting of the Southampton Borough Council held last Wednesday, Alderman Le Feuvre endeavoured to resume the discussion on the report of the Parliamentary Committee on the local Water Bills, noticed in the "JOURNAL" for the 30th ult. It may be remembered that at a previous meeting the speaker used an offensive expression which he would not withdraw; whereupon the Mayor left the chair, and the business was unfinished. The adoption of the report was again moved; and, after a warm debate, the motion was carried unanimously.

The Exeter Gas Company's New Holder.—Some time ago, considerable stir was caused in Exeter by the placing of a contract by the Gas Company for a new holder with an outside firm, though the tender of Messrs. Willey and Co., whose works adjoin those of the Company, was £500 lower than that of the successful parties. The holder, which will contain a million cubic feet of gas, has just been subjected to the air test; and the contract is almost completed. The work, however, is rather behind, as it should have been finished, according to the specification, by the 16th of January last, under a penalty of £20 a week for delay. As some months have elapsed since that date, the penalty, if enforced, will come to between £300 and £400. In the meantime, the Company have been deprived of the assistance they expected to get from the holder.

Municipalities and Labour Interests.—The Employers' Parliamentary Council have just issued a statement, based upon parliamentary returns, showing the conditions of contract imposed in the interests of labour by Local Authorities in county boroughs, non-county boroughs, and other urban districts in England and Wales. The conditions as to wages vary very much in different localities, and may be classified under the following main heads: (1) Current rates, (2) rates recognized by trade unions, (3) rates agreed on by associations of employers and employed, (4) rates fixed in contract. The conditions included in each of these clauses are not absolutely identical. Some authorities require the wages paid to be those in force within their own jurisdiction; others specify they shall be those in the district where the work is executed.

Suicide by Coal Gas.—Mr. C. L. Drew held at inquiry at Chelsea on Saturday into the circumstances surrounding the death of Miss Mary Hayward Walker, aged 40, a single lady, who had lately resided at Durham Place, S.W. Mr. J. H. Allen, a barrister, said the deceased, who was his sister-in-law, had latterly had no occupation, but had resided a great deal at his house. She suffered from insomnia, melancholia was very marked, and she had threatened to destroy herself. She slept alone in a room, in which there was a gas-bracket, and on the previous Thursday morning he was called by the housemaid, who had found the door of the room locked. The room when broken into was full of gas—the window being fastened, and the register of the stove closed. A rug had been placed against the door to prevent the exit of the gas. The deceased was lying on the bed, undressed, and dead. Under the pillow was found an empty bottle. Dr. T. Woolfe Flannagan stated that the deceased must have taken a large quantity of pure chlorodyne. Death was due to coma from gas poisoning. The Jury returned a verdict of "Suicide while temporarily insane."

Rochdale Corporation Gas Supply.—The Gas Committee of the Rochdale Corporation had a thoroughly satisfactory record to present to the ratepayers in their annual report recently issued. The consumption of gas during the past financial year, both for lighting and heating purposes, shows a very encouraging increase. The total production was 480,226,000 cubic feet, against 452,755,000 cubic feet in the previous year—an increase of 27,471,000 cubic feet. This quantity is about equal to a year's production at the time the works were purchased by the Corporation. The consumption of gas for purposes other than lighting is given as more than 70 million cubic feet per annum; and the increase for the past year over 1898 is equal to 12¼ per cent. The number of automatic prepayment meters now in use is 810, against 498 in 1897-8; and the amount collected from them is £859 13s. 10d. This shows an average consumption of 6368 cubic feet per meter. The net profit on the year's working amounts to £8984, or £1163 in excess of the previous year. The low price obtained for coke during the period under review has had a very appreciable influence in reducing the available surplus; the receipts from this source showing a falling off of £966, notwithstanding the larger quantity sold. It is satisfactory to find, however, that, since closing the accounts, a much better demand has sprung up, and considerably higher prices can now be obtained.

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109, Farringdon Road, LONDON, E.C.

Telegrams: "GASMAIN, LONDON."

BRISTOL: 28, BATH STREET. Telegraphic Address: "GOTHIC."

BIRMINGHAM: 1, OOZELLS STREET. Telegraphic Address: "GOTHIC."

MANCHESTER: 87, BLACKFRIARS STREET. Telegraphic Address: "GOTHIC."

OUR LATEST AWARD

PRIX D'HONNEUR

COOKERY AND FOOD EXHIBITION,

Imperial Institute,

LONDON,

MARCH, 1899.

Municipalization of the Morecambe Gas Supply.—A few weeks ago, the Morecambe Gas Company obtained a Provisional Order to increase their capital. The District Council unsuccessfully opposed the application, and then entered into negotiations to purchase the undertaking. On Monday last week deputations of the Council and the Company came to London, and the next day terms of purchase were arranged between the parties, and the necessary agreement executed.

Tipton Gas Supply.—According to the accounts of the Gas Department of the Tipton District Council for the twelve months ending the 31st of March, the revenue amounted to £14,425, and the expenditure to £8483; leaving a balance of £5942. In the preceding year, the figures were £13,705, £8067, and £5638. The balance of net profit is £1697; and this added to the balance of £2289 brought forward makes a total of £3986. No less a sum than £3808 has been paid for various purposes out of the accumulated profit of the gas undertaking in preceding years. The manufacturing statement shows that, under the supervision of Mr. Vincent Hughes, the Engineer and Manager, 8511 tons (20 cwt.) of coal and cannel were carbonized, producing 93,570,000 cubic feet of gas, or at the rate of 10,994 cubic feet per ton. Of the entire bulk of gas sent out (93,419,660 cubic feet), 85,194,941 cubic feet were sold, and the rest—about 8·80 per cent.—was lost by leakage, condensation, &c. There were 5225 tons of coke and breeze, 95,590 gallons of tar, and 255,353 gallons of 10-oz. ammoniacal liquor produced in the twelve months.

Gas Supply in the Suburbs of Cape Town.—According to reports received by the last mail, a new arrangement has been entered into with reference to the supply of gas in the suburbs of Cape Town. A short time ago the Cape Town and District Gas Company applied to the Municipal Councils of Wynberg, Claremont, and Rondebosch for permission to lay mains and service-pipes in any street, road, or thoroughfare for the supply of gas within their respective municipal areas. A Joint Committee of the three Councils was appointed to consider the application; and, as the result of their conference and negotiation, an agreement has been drawn up and only awaits formal signature. It provides that the permission to lay mains and services shall be granted for a term of five years, with the right of renewal; but the Councils are to have the privilege, at the termination of five years, or any subsequent period, on giving twelve months' notice of their intention to do so, to purchase or take over, without compensation for vested rights or goodwill, all the machinery, pipes, plant, buildings, and appliances of the Company within the municipal area, either by mutual arrangement or by arbitration. Permission to the Company is to be cancelled on failure to begin operations within six months after date of the agreement. Conditions are prescribed as to the manner in which the work is to be done, and the roads repaired after being broken up. It is also provided that the prices to be paid by the Suburban Councils or private consumers for the supply of gas, meter-rent, or for the laying of private service-pipes, shall not exceed those ruling at the time in the city of Cape Town; the Councils to have a discount of 10 per cent. on current rates for light supplied to street-lamps or for any municipal premises or purposes. The Company are to pay £50 per annum to each Council for right of way and for privileges granted.

The Sale of the Rayleigh Gas-Works.—In accordance with the announcement which appeared in our advertisement columns, Mr. Alfred Richards offered for sale last Tuesday, at the Mart, Tokenhouse Yard, the freehold gas-works at Rayleigh, Essex. There was a good deal of competition for them; and they eventually fetched £1270.

Continental Union Gas Company, Limited.—The Board have resolved that the interim dividend to be paid on the 4th prox. shall be at the rate of 4 per cent. for the half year on the ordinary stock, tax free, and of 3½ per cent. for the half year on the preference stock, less tax. A circular is being sent to the proprietors which states that, "in return for an extension of the concession of the city of Milan, a large reduction in the price of gas had to be agreed to, which for some period seriously reduces the profits of the Company. The Directors consequently consider it prudent to diminish the amount of the interim dividend."

Additional Water-Mains for Margate.—Colonel W. Langton Coke, M.Inst.C.E., recently held an inquiry at Margate, on behalf of the Local Government Board, with respect to the application of the Town Council for sanction to borrow £4100 for water-works purposes. The Town Clerk (Mr. G. Foord-Kelcey), who conducted the proceedings, said the above-named sum was required for new mains which it was desirable should be laid at once. In reply to the Inspector, the Manager of the water-works (Mr. F. Stanley), said the 9-inch mains would be 3 feet and the smaller ones 2 ft. 6 in. under cover. The Inspector said probably the Board would in future insist that, where mains were paid for out of a loan, they should be laid at a depth of 3 feet. There was no opposition to the proposal.

Cape Town and District Gaslight and Coke Company, Limited.—The ninth ordinary general meeting of this Company was held last Tuesday, at Winchester House, E.C.—Mr. John Boustead presiding. The Secretary (Mr. W. Lewis) having read the notice convening the meeting, the Chairman congratulated the shareholders on the favourable report which had been presented, and added that there had been a decided increase in the business of the Company. The only disagreeable feature was that there was a larger amount of leakage than might be desired—being 17·85 per cent.; but during the past two years it had been diminished by 6·4 per cent., and he thought that they might hope to get it down to 10 per cent. The Manager (Mr. S. E. Stevenson) reported that the works at Cape Town and Woodstock were in first-class condition. Including the balance brought forward, the amount at the credit of the profit and loss account—after providing for the dividend on the preference shares, the debenture interest, and the debit of £5536 for repairs and renewals of works, plant, &c, and outstanding preliminary expenses, now written off—was £7974, out of which an interim dividend at the rate of 8 per cent. per annum was paid last October. It was now proposed to pay a further dividend at the rate of 7 per cent. per annum for the six months ending Dec. 31, 1898; making 7½ per cent. for the year, and leaving £747 to be carried forward. After expressing regret at the death of the Hon. Henry Noel, a Director, he announced that as the growth of the Company now necessitated very close attention, the Board had appointed Mr. J. A. Kelman as Managing Director. The report was adopted after a short discussion.

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English Coal for the Paris Gas Company.—A contract has lately been entered into in Newcastle for supplying the Paris Gas Company with 40,000 tons of coal, to be delivered over the next three years, at 8s. per ton, f.o.b., which is a marked advance on last year's rates.

The Proposed Municipalization of the Ossett Gas-Works.—At a special meeting of the ratepayers of Ossett, held a few days ago to consider the advisability of consenting to the resolution passed by the Council to purchase the gas-works, the Mayor (Mr. F. L. Fothergill), who presided, moved a formal resolution sanctioning the application of the funds of the borough to the promotion of a Bill in Parliament authorizing the purchase, and the borrowing of the necessary money for the purpose; and it was carried by an overwhelming majority.

The Bridlington Water-Works Loan.—A short time ago, an announcement was made that the Bridlington District Council had obtained a loan of £70,000 from the Bank of England to complete the purchase of the water-works. Since then, however, the Hull representatives of the Bank have written to say that, in consequence of the inordinate delay on the part of the Council in taking up the loan and the state of the Money Market, the authorities had instructed them to give notice for repayment in three months. At the same time, they were to mention that the Bank had at present no intention of dealing with the capital, and would consider an application for a renewal of the loan if made by the Council within three months, having regard to the altered state of the market.

The Lighting of Festiniog.—At the last meeting of the Festiniog District Council, the Surveyor (Mr. Alltwen Williams) presented a report on the condition of the gas-works. He pointed out that the gasholder at Blaenau Festiniog was inadequate, and that the works were small, antiquated, in bad condition, and utterly insufficient to supply the town. Before they could be rendered of practical use, an outlay of about £3000 would be entailed. The quantity of gas consumed by the public during the past year was 2,784,700 cubic feet, and for public lighting 130,000 cubic feet; but, owing to the wretched condition of the mains, there was a leakage of about 1,432,000 cubic feet. The Surveyor expressed the opinion that it would not be wise to spend a large amount to improve the works. Reference was made to the fact that the district was so bountifully supplied by Nature with water power, that lighting could be cheaply provided by electricity. It was decided to apply to the Board of Trade for a Provisional Order for electric lighting powers.

Bury Corporation Gas Supply.—On the presentation of the minutes of the Gas Committee at the meeting of the Bury Town Council last Thursday, the Chairman of the Gas Committee (Mr. Byrom) stated that a profit had been made during the past financial year of £4,500. It was proposed to carry £2250 to the general rate, and a similar sum to the credit of the gas consumers in a reduction of 2d. per 1000 feet in the price of gas. In the previous twelve months there was a loss of £1606; and it might be asked how the present profit had been made. The main item of profit was due to the rise in the price of residuals—almost equal to £3000. They had made 21 million cubic feet more gas and paid less for coal. The net price of gas would now be 2s. per 1000 feet; and but for the threatened rise in the price of coal, it would have been 1s. 10d. They had received £2000 from the Coal Company to compensate them for the loss sustained through the Contractors supplying them with coal of a quality inferior to that arranged for; and this sum had been carried to the reserve fund.

A Huge Loan for the Birmingham Corporation Water Department.—The Finance Committee of the Birmingham City Council, in a report just issued, state that the time has nearly arrived when the Water Committee will require provision to be made for additional capital in connection with the Welsh water-works. It is estimated that the expenditure on this account, during the current financial year, will be about three-quarters of a million, and a like amount in the year following. The Chairman of the Committee, accompanied by the Town Clerk and Treasurer, recently had an interview with the authorities of the Bank of England, when they were advised that the present is not a favourable time for further public issue of Corporation stock. Under these circumstances, the Committee recommend that a formal application be made to the Public Works Loan Commissioners for a loan of £1,500,000, to meet the requirements of the Water Department for the next two years, upon the following terms: (1) The total amount to be receivable by monthly instalments of £62,500 each; (2) the loan to bear interest at the rate of $2\frac{3}{4}$ per cent. per annum; and (3) to be repayable to the Commissioners in thirty years.

Our readers will see, by the prospectus which appears in another part of the "JOURNAL," that a Company has been formed to acquire the businesses of Messrs. C. Wilson and Sons and Messrs. Mathieson, Wilson, and Co., of Leeds, and to amalgamate them under the title of Wilsons and Mathiesons, Limited. The first-named undertaking was established in 1854, and is well known in connection with gas-stove manufacture; the second, in 1888, for the production of light and artistic castings previously confined almost exclusively to Scotland. The works of both firms give employment to upwards of 600 hands. The share capital of the Company is £115,000, divided into 6000 5 per cent. preference shares of £5 each and 85,000 ordinary shares of £1 each; and there will be $4\frac{1}{2}$ per cent. debenture capital to the amount of £35,000. The purchase price of the undertakings is £143,000, of which £10,000 is payable to the vendors in preference shares, £85,000 in ordinary shares, and the balance of £48,000 in cash; consequently, 4000 of the preference shares (which are cumulative and preferential both as to capital and dividend) and the whole of the debentures are offered for subscription. The value of the property to be acquired (freehold land, buildings. and loose plant) is put at £51,419; and the stock is estimated to be worth £15,133—together, £66,552. The working of the two firms during the past four years appears to have been satisfactory; the average annual profit having been certified as sufficient to pay several times over the debenture interest and preference dividend of the new Company. The vendors will be Directors for five years; and the present staff will be taken over.

In view of the interest taken by a number of gas engineers and managers in the series of articles contributed to the "JOURNAL" towards the close of last year by Mr. E. W. T. Richmond, under the title of "Slot Cookers and All About Them," the Company of which the author is Chairman and Managing-Director have had them reprinted in pamphlet form, together with some valuable additional matter, which has converted what was originally intended to be only a short history of the development of prepayment meter installations, into a useful collection of statistics bearing upon this important question. The extent to which "slot" cookers are used is graphically shown by a specially prepared map of England, with portions of Scotland and Ireland; while tabulated particulars are furnished as to the kind of cooker or griller supplied, the number of brackets and pendants fixed, the rental (if any) charged, the price of gas to ordinary and prepayment consumers, and the number of cubic feet of gas supplied for a penny. Illustrations are given of the different types of "slot" cookers and small stoves supplied by Messrs. Richmond and Co., so as to facilitate selection. With this pamphlet, therefore, which has been tastefully got up, upon his table, a gas manager who did not read the articles when they appeared in our columns will be able to follow, as opportunity may serve, Mr. Richmond's pleasantly-told story; and, if he has not already introduced "slot" cookers, he will be able to readily ascertain who among his colleagues have done so, and the conditions under which the system has been introduced. Lists are given of name and town references; and there is an index to the illustrations.

Last Tuesday, an exhibition was opened in St. George's Hall, Bradford, under the auspices of the Gas Department of the Corporation. The exhibits were supplied by the Davis Gas-Stove Company, Limited, Messrs. Fletcher, Russell, and Co., Limited, Messrs. Richmond and Co., Limited, Messrs. Charles Wilson and Sons, and Messrs. John Wright and Co., Limited. The exhibition was opened by the Chairman of the Gas Committee (Alderman T. Speight), who was supported by the Corporation Gas Engineer (Mr. Charles Wood). Miss Holroyd gave demonstrations in cookery. The first of a series of lectures on gas cooking, promoted by Messrs. Richmond and Co., Limited, under the auspices of the Gas Department of the Leeds Corporation, was delivered in the Leeds Church Institute last week by Miss Lillie Richmond. It had been announced that Mrs. Boyd Carpenter would preside at the opening lecture; but she wrote regretting that, owing to a severe cold, she found herself unable to be present. In the course of her letter, which was read to the audience, Mrs. Boyd Carpenter expressed her belief that "much good may, and must, be done by the teaching of the simple but necessary art of cookery. Wholesome and nourishing food plays a large part in the happiness of every home, and in the well-being of every individual. . . . For the highest reasons, therefore, it is desirable that the importance of this homely art should be widely recognized, and that it should be raised in public thought to that position of dignity which its importance deserves." An exhibition of gas appliances has also lately been held by the Davis Gas-Stove Company, Limited, at Northampton, with lectures by Mrs. Springthorpe. Messrs. Richmond and Co. have also held exhibitions at Linlithgow and Ramsay, with lectures by Miss Dods and Miss Barker.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to the Company as above.

WINKLEMANN'S ORIGINAL "VOLCANIC" FIRE CEMENT and "VOLCUM" PASTE. Always ready for use in GAS-WORKS. Resists 4500° Fahr.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street, E.C.
"Volcanism, London."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SEASON 1899.

BALE'S OXIDE OF IRON, of finest Quality. Summer delivery specially recommended for efficiency and economy.
FIRE CEMENT, PAINT, and CHEMICALS.
120 and 121, NEWGATE STREET, LONDON, E.C.

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH; NEWTON GRANGE, NEWBATTLE, DALKEITH, SCOTLAND.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

TO GAS AND WATER OFFICIALS.
CYCLES of the Highest Quality at reasonable Prices. Catalogue, post free. For CASH, or on GRADUAL PAYMENT SYSTEM. *Sent on approval. Twelve Months' Guarantee.*
MELROSE CYCLE COMPANY, COVENTRY.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND Co., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see p. 1518.]

SPENT OXIDE wanted.
BROTHERTON AND Co., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

IRON OXIDE (Bog Ore), best quality, for the Purification of Gas, containing up to 85 per cent. Hydrated Oxide of Iron, and absorbing while being used a high percentage of Blue.
S. BOWLEY AND SON, Wellington Works, Battersea Bridge, LONDON, S.W.

SULPHURIC ACID for Sale.
BROTHERTON AND Co., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1769.

PATENTS FOR INVENTIONS.
Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

IMPORTANT.
REPAIR your old Retorts with Patent STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Estimates for all kinds of Retort-Settings.
Write CROWTHER, Retort Setter, and Sole Maker of Stickfast Fire Cement, Manor Street, HUDDERSFIELD.

GAS TAR wanted.
BROTHERTON AND Co., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PRACTICAL RETORT SETTER.
GEORGE NUTTALL, 32, Havelock Road, Saltley, Birmingham.
Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

SULPHATE OF AMMONIA SATURATORS.
JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

SHEFFIELD CHEMICAL COMPANY, LIMITED.
BUYERS of Spent Oxide. Sellers of OXIDE OF IRON and SULPHURIC ACID.

ADVERTISER desires Situation as FITTER. Well up in Slot work and Fittings, Cookers, Fires, Service Laying, and Meter Taking. Good References.
Address B.G., 10, Bellevue Road, RAMSGATE.

ADVERTISER desires Situation as FITTER. Well up in Iron and Compo., Cookers, Fires, Main and Service Laying, and Meter Taking. Home or Foreign Appointment. Good Testimonials.
Address No. 3288, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a practical Working Manager, the MANAGEMENT of a Gas-Works, where the make is from 15 to 20 Millions, or Outside Superintendent of a larger Works. Has held present position five-and-a-half Years. A change desired.
Address No. 3274, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS or Water Fitter desires Situation as FOREMAN or WORKMAN either at Home or Abroad. Competent in all Branches. Automatic Installations, Stoves, Fires, &c. Nine years' practical Experience. Unmarried. Good References.
J.F., 26, Denton Street, Bury, LANCS.

GAS STOVE Manufactory. Works MANAGER wanted. Must be well qualified and experienced in Foundry Work.
Address No. 3285, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Man for Sulphate Making. Must be capable of working the Continuous System, and willing to make himself useful in a Gas-Works. Wages 33s. per week to a capable Man.
Apply to the GAS COMPANY, Richmond, SURREY.

WANTED, a good Gas-Fitter well up in Iron and Compo. One who has had experience with Incandescent Burners preferred. Wages 30s. per week.
Apply B. BARK, Gas-Works, GODALMING.

WANTED, two Carbonizing Foremen, accustomed to Regenerative Furnaces and Inclined Retorts.
Apply, by letter, enclosing *copies* of three recent Testimonials as to Character and Abilities, to No. 3227, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GENERAL FOREMAN required at Gas- Works in Midlands. Mechanical Training and good Experience with modern Gas Plant and Manufacture indispensable. Commencing Salary £3 5s. per week. No allowances.
Apply, by letter, stating Age, with References, &c., to No. 3282, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the West Kent Gas Company, a Gentleman, between the age of 25 and 40, to fill the post of COLLECTOR and OUTDOOR SUPERINTENDENT. He must reside in the District.
State previous Experience and Terms required, to R. P. KEYS, Secretary, West Kent Gas Company, Brighton Chambers, Denman Street, BOROUGH, S.E., before June 16.

RESIDENT SUPERINTENDENT
WANTED to take the management of of an IMPORTANT GAS-WORKS (under the direction of the Engineer), designed for the carbonization of about 100,000 Tons of Coal per annum, and now in course of development. Good knowledge of construction and of modern Gas Plant and Gas Making are required. Maximum Salary £525 per annum. No allowances. Commencing Salary according to Age and Qualifications.
Apply, by letter, stating Age, References, &c., to No. 3291, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE, cheap—
Two PURIFIERS, 8 ft. square by 4 ft. deep.
Two " 5 ft. " 4 ft. "
One " 5 ft. " 3 ft. "
One EXHAUSTER, 20,000 Cubic Feet per hour.
Two " 5000 " " "
Also CONDENSERS, SCRUBBERS, WASHERS, GASHOLDERS and TANKS, VALVES, &c., &c.
Apply to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

BOROUGH OF MOSSLEY.
FOR SALE.
COKE Elevating and Conveying Plant. Also 10-Horse-Power CROSSLEY'S GAS ENGINE. Practically new.
Can be seen at the Gas-Works or Particulars can be had on application to the undersigned.
F. W. JOHNSTON,
Engineer and Manager.

THE Wolverhampton Gas Company have FOR SALE, at their Horsley Fields Works, the following SECOND-HAND PLANT comprising: Retort-Fittings, Two Exhausters, Two Steam-Engines, Two Boilers, Two Sets of Vertical Cast-Iron Condensers, Two Scrubbers about 25 ft. by 7 ft., Station Meter, Governor, Cast-Iron Tanks, Weighing-Machine, Roof Principals, &c.
The above can be seen by appointment.
For further Particulars apply to the MANAGER, Gas Company, WOLVERHAMPTON.

GAS Plant for Sale. No reasonable offer refused:—
HYDRAULIC MAINS, MOUTHPIECES, &c. (Self Sealers). Also
Four Wrought Iron Annular Condensers.
Six-inch PIPE CONDENSERS.
TOWER SCRUBBER, 3 ft. by 12 ft., Tank Tippler, &c., complete.
TOWER SCRUBBER, 6 ft. 6 in. by 12 ft., complete.
TOWER SCRUBBER, 5 ft. by 25 ft., or 49 ft., complete.
ENGINES and EXHAUSTERS, 5000 to 30,000 feet per hour.
PURIFIERS, Several sizes and sets complete.
STATION METER, 8000 cubic feet per hour complete.
Six-inch STATION GOVERNOR, complete.
GASHOLDERS, one 35 ft. by 14 ft. counterbalanced. Six Years.
All guaranteed good order and condition.
J. FIRTH BLAKELEY & Co., Thornhill, DEWSBURY.

COUNTY BOROUGH OF OLDHAM.
THE Gas-Works Committee invite TENDERS for the TAR and AMMONIACAL LIQUOR to be produced at their different Gas Stations for a period of One or more Years, commencing the 1st of July next.
The yearly make of Tar is about 7600 Tons, and of Ammoniacal Liquor about 2,500,000 Gallons.
Particulars and Forms of Tender can be obtained on application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders are to be sent on or before Tuesday, June 20, 1899.
A. NICHOLSON,
Town Clerk.
Oldham, May 23, 1899.

DUKINFIELD.
TENDERS FOR COAL.
THE Gas Committee of the Council of Dukinfield require TENDERS for 7000 Tons of GAS COAL.
Particulars and Forms of Tender can be had from the undersigned.
Tenders, endorsed "Coal," will be received by Mr. Councillor Cooke here not later than Twelve o'clock noon of Wednesday, the 21st of June.
The Committee do not bind themselves to accept any Tender.
HARRISON VREVERS, C.E.,
Engineer and Manager.
Gas Offices, Dukinfield,
May 31, 1899.

TENDERS FOR TAR.
THE Gas Committee of the Carnarvon Corporation invite TENDERS for the purchase of the surplus TAR made at their Works during the Twelve Months ending the 31st of August, 1900.
The Tar will be loaded free into Contractor's Tank Trucks on Rail at the Gas-Works Siding, Carnarvon.
Payments: Net Cash Monthly.
Sealed Tenders, endorsed "Tender for Tar," and addressed to the Chairman of the Gas Committee, Guildhall, Carnarvon, to be delivered on or before Thursday, the 22nd inst.
The Committee do not bind themselves to accept the lowest or any Tender.
Any further Information may be had from the undersigned.
WILLIAM M. RUXTON,
Manager.
Gas Office, Carnarvon,
June 1, 1899.

TENDERS FOR GAS COAL.
THE Gas Committee of the Carnarvon Corporation invite TENDERS for the supply of 2500 Tons of best screened GAS COAL and 200 Tons of screened CANNEL, to be delivered free, as required, in Trucks on the Gas-Works Siding, Carnarvon, during the Twelve Months ending the 31st of August, 1900.
Sealed Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the Gas Committee, Guildhall, Carnarvon, to be delivered on or before Thursday, the 22nd inst.
The Committee reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any Tender.
Forms of Tender and Specification may be had on application to the undersigned.
WILLIAM M. RUXTON,
Manager.
Gas Office, Carnarvon,
June 1, 1899.

CARNARVON CORPORATION.
THE Gas Committee of the Carnarvon Corporation invite separate TENDERS for the following:—
1. Erecting four PURIFIERS, 12 feet square, with Connections and Lifting Crane.
2. Erecting two ENGINES and EXHAUSTERS, with Connections.
3. STATION METER, with connections.

Sealed and endorsed Tenders must be addressed to the Chairman of the Gas Committee, Guildhall, Carnarvon, and delivered not later than the 22nd of June.
Plans and Specifications may be had on application to Mr. Henry Woodall, Queen Anne's Mansions, St. James's Park, London, or to the Gas Manager, Guildhall, Carnarvon, on payment of 10s. 6d. per set, which will be returned on receipt of a *bonâ-fide* Tender.
The Committee do not bind themselves to accept the lowest or any Tender.
D. H. JONES,
Borough Accountant.
May 31, 1899.

CARDIFF GASLIGHT AND COKE COMPANY.
TENDERS FOR COALS.
THE Directors of the above Company are prepared to receive TENDERS for a supply of 79,000 Tons of Best Well-Screened large GAS COALS, to be delivered between August, 1899, and the 30th of June, 1900, in monthly quantities in accordance with the Specification.
Parties tendering may do so for the whole quantity, or for quantities of from 5000 Tons upwards.
Forms of Tender and Specification of monthly deliveries may be obtained on application to the Engineer and Manager, Mr. H. Morley, M.Inst.C.E.
Sealed Tenders to be sent to the undersigned not later than Ten a.m. Thursday, the 6th day of July next, addressed to the Chairman of the Company, endorsed "Tender for Coal."
The Directors do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to apportion the whole quantity as they may think fit.
By order,
GEORGE CLARRY,
Secretary.
Gas Offices, Cardiff,
May 31, 1899.

The Subscription Lists will open on Monday, June 5th, and close on or before Thursday, June 8th, at 3 p.m.

WILSONS & MATHIESONS, LTD.,

Gas Stove Manufacturers, Artistic & General Iron Founders,

CARLTON WORKS and SCOTCH FOUNDRY, ARMLEY, LEEDS, and LONDON.

This Company is an amalgamation of the two well-known firms of CHAS. WILSON & SONS, Gas Stove Manufacturers, Leeds, and MATHIESON, WILSON, & CO., Ironfounders, Leeds.

INCORPORATED UNDER THE COMPANIES ACTS, 1862 *TO* 1898.

CAPITAL - - - - - - - £115,000

4½ PER CENT. DEBENTURES £35,000

The Capital is Divided into

6,000 Five per Cent. Preference Shares of £5 each	£30,000
85,000 Ordinary Shares of £1 each	£85,000

The Preference Shares are Cumulative and Preferential both as to Capital and Dividend.

The Debenture issue is of 4½ per cent. first Mortgage Debenture Stock *at par* to the amount of £35,000, which will be issued in multiples of £10.

The whole of the Ordinary Share Capital will be taken by the Vendors in part payment of the purchase money.

4,000 of the Preference Shares and the whole of the Debentures are offered for Subscription, payable as follows:

	Preference Shares.	*Debenture Stock.*
On Application	£2	10 per cent.
On Allotment	£2	40 „
On July 8th, 1899	£1	50 „

The Debenture Stock will be secured by a Trust Deed, constituting a specific first mortgage upon the freehold properties purchased, and a floating first charge upon all the other property and assets of the Company, including the uncalled capital for the time being.

The interest on the Debenture Stock and Preference Shares will be paid half yearly on the 1st of January and the 1st of July in every year; the first payment (calculated from the due dates of payment of the several instalments) being payable on the 1st of July, 1899.

By the Trust Deed securing the Debenture Stock, the Company covenant with the Trustees that, pending the redemption of such Stock, the Stock-in-Trade, Book Debts, Cash, and Reserve Fund shall always together amount to not less than **£25,000.** This is, of course, additional security to the freeholds, machinery, &c., which it will be seen are valued at £51,419 8s. 7d.

It is provided by the Trust Deed that the Debenture Stock will be redeemed on the 1st day of January, 1924, at par, or at any time after the 1st day of January, 1910, at the option of the Company at £105 per cent. on giving the holders six calendar months' notice, or in the event of a voluntary winding up at any time prior to the 1st day of January, 1924, for the purpose of reconstruction, amalgamation, or otherwise, at the price of £105 per cent.

In any future issue of Ordinary Shares, preference will be given to the holders of Debenture Stock and Preference Shares.

TRUSTEES FOR THE DEBENTURE HOLDERS.

F. W. TANNETT-WALKER, Esq., J.P., Carr Manor, Meanwood.
(TANNETT-WALKER & Co., Leeds.)

WILLIAM ILLINGWORTH, Esq., Bramhope Manor.
(Messrs. ILLINGWORTH, INGHAM, & Co., Leeds.)

DIRECTORS.

CHAS. CARR WILSON, Blenheim Terrace, Leeds (Messrs. Chas. Wilson & Sons), *Chairman.*
WILLIAM MATHIESON, Riseholme, Horsforth (Messrs. Mathieson, Wilson, & Co.) *Vice-Chairman.*
HENRY WILSON, Rock View, Armley (Messrs. Chas. Wilson & Sons).
THOS. ARTHUR DRAPER, Oak Villa, Vinery Road, Leeds (Messrs. Mathieson, Wilson, & Co.).
JAMES WILLIAM WILSON, Summer Hill, Far Headingley (Messrs. Chas. Wilson & Sons).
ALEXANDER MATHIESON, Spring Grove Terrace, Leeds (Messrs. Mathieson, Wilson, & Co.).
CHAS. ALBERT WILSON, Blenheim Terrace, Leeds (Messrs. Chas. Wilson & Sons).
} Members of the Vendor Firms.

BANKERS.

THE YORKSHIRE BANKING COMPANY, Leeds, and its Branches.

BROKERS.

HOWITT & PEMBERTON, Sun Buildings, Park Row, Leeds.

SOLICITORS.

SIMPSON & SIMPSON, 47, Albion Street, Leeds; and 27, King Street, Cheapside, London, E.C.

AUDITORS.

BEEVERS & ADGIE, Albion Street, Leeds.

SECRETARY AND REGISTERED OFFICE.

JAMES TODD WHITAKER, Carlton Works, Armley, Leeds.

PROSPECTUS.

The Company has been formed to acquire as going concerns, as from the 1st of January, 1899—

(1) The business of Gas Stove Manufacturers, Gas and General Engineers, which has been carried on by Mr. C. C. Wilson in co-partnership with his sons, Hy. Wilson, Jas. Wm. Wilson, and Chas. Albert Wilson, at Leeds, under the style of CHARLES WILSON & SONS.

(2) The business of Artistic and General Iron Founders, Stove-Grate Manufacturers, &c., carried on by MATHIESON, WILSON, & CO., at Scotch Foundry, Armley, Leeds, and the freeholds, stock-in-trade, patents, trade marks, designs, and other assets of both firms.

The business of CHARLES WILSON & SONS was founded in the year 1854 by Mr. C. C. Wilson, and has since become one of the best known businesses in the Gas Stove Industry, the firm being now recognised as of the highest standing in their branch of manufacture—viz., that of Gas Cooking Stoves, Gas Ranges, Gas Fires, &c.

The increasing popularity of the use of gas supplied for cooking and heating purposes has resulted in a very large increase in the trade carried on by Messrs. CHARLES WILSON & SONS.

Their works were formerly situated in Woodhouse Lane, but the accommodation having become altogether insufficient, they have recently erected new works immediately adjacent to those of Messrs. Mathieson, Wilson, & Co., below referred to at Armley.

The London-Premises are situated in Queen Street, one of the main thoroughfares of the City, and include Show Rooms admirably adapted for the exhibition of Gas Stoves manufactured by the firm.

The business of Messrs. MATHIESON, WILSON, & CO., was commenced by Messrs. W. & A. Mathieson and Mr. Draper, in conjunction with Messrs. Wilson, in 1888. This firm was the first to introduce into Yorkshire the successful manufacture of Light and Artistic Castings, hitherto produced almost exclusively in Scotland. Provision was made by the employment of Scotch workmen, more particularly skilled in this class of work, for the establishment and growth of a new class of trade. The result has been a continuous and rapid increase of the manufactures of the firm, which are known throughout England, and are held in high repute.

Attention is called to the description of both works appearing in the letter of Messrs. Wheatley Kirk, Price, and Goulty, set out below.

The works of both firms give employment to upwards of 600 hands.

The two firms have hitherto carried on their businesses independently, but to a large extent have worked in co-operation, and an effective amalgamation is the natural result of the position in which they now stand in reference to each other. The Directors are satisfied that the result of such amalgamation will be an extended trade carried on with increased economy in working expenses, efficiency in management, and a corresponding increase of profits.

Messrs. Beevers & Adgie, Chartered Accountants, of Leeds, the Auditors of both firms, certify as follows :—

AUDITORS' CERTIFICATE.

To the Directors of Wilsons & Mathiesons, Limited.

We have regularly audited the Books of Messrs. Charles Wilson & Sons, Carlton Works, Leeds, from July 1st, 1887, to December 31st, 1898, and of Messrs. Mathieson, Wilson, & Co., Scotch Foundry, Armley, from February 1st, 1888, to December 31st, 1898. We hereby certify that THE ANNUAL AVERAGE PROFIT of the two Firms for the last four years, after making proper allowances for Depreciation and Management, HAS BEEN SUFFICIENT TO PAY THE DEBENTURE INTEREST AND PREFERENCE DIVIDEND OF WILSONS & MATHIESONS, LTD., SEVERAL TIMES OVER.

We further certify that during the period under review the Profits have shown a substantial increase each year.

Yours faithfully,

Beevers & Adgie, Chartered Accountants.

92, Albion Street, Leeds, May 25th, 1899.

Messrs. WHEATLEY KIRK, PRICE, & GOULTY, the well-known trade valuers of Manchester and London, have valued the freehold properties, fixed and loose plant, and utensils included in the sale, and their valuation is as follows:—

To the Directors of Wilsons & Mathiesons, Limited,

WE, THE UNDERSIGNED, having been appointed to value the Freehold Land and Buildings, Motive Power and Going Gears; Steam, Water, Gas Heating, and Electric Light Services; Fixed Plant and Machinery, Trade Fixtures, Loose Tools and Utensils, Office Furniture and Fittings, Horses, Carts, &c.; Patterns, Drawings, Wood Blocks and Electros, in, upon, and belonging to the several works, premises known as "The Scotch Foundry," situate in Forge Lane, Armley Road, Leeds, in the County of York, the property of Messrs. Mathieson, Wilson, and Company; also "The Carlton Works," situate in Armley Road, aforesaid, the property of Messrs. Charles Wilson & Sons, Gas Stove Manufacturers.

THIS IS TO CERTIFY that we have carefully examined and valued the above-mentioned items as and on the thirty-first day of December, one thousand eight hundred and ninety-eight,

AND HEREBY DECLARE the value thereof to be in our opinion the sum of THIRTY-TWO THOUSAND SIX HUNDRED AND EIGHTEEN POUNDS AND THREE PENCE (£32,618 0s. 3d.) and EIGHTEEN THOUSAND EIGHT HUNDRED AND ONE POUNDS EIGHT SHILLINGS AND FOUR PENCE (£18,801 8s. 4d.) respectively, as Current Going Concerns, but exclusive of Goodwill.

WITNESS our hand this twenty-fourth day of May, one thousand eight hundred and ninety-nine.

WHEATLEY KIRK, PRICE, & GOULTY,
Valuers,
London and Manchester.

£32,618	0	3	Messrs. Mathieson, Wilson, & Co.
18,801	8	4	Messrs. Charles Wilson and Sons.
£51,419	8	7	

The Directors have also received the following letter from the Valuers :—

49, Queen Victoria Street,
London, E.C., May 29th, 1899.

To the Directors of Messrs. Wilsons & Mathiesons, Limited.

Dear Sirs,

Referring to the valuation which we have recently completed of your Freehold Works (over 4 acres)—viz., The Scotch Foundry and the Carlton Works, both situate at Armley, Leeds, we have much pleasure in stating that we were very favourably impressed with the substantial and high-class character of everything pertaining to the businesses. The buildings, which have a floor space of over 17,000 yards, are (with a few unimportant exceptions), unusually substantial, and of handsome elevation, situate in an improving neighbourhood, bounded by Main Road and Railway Siding.

The Plant and Machinery are thoroughly up-to-date, both factories being largely driven and lighted by Electricity.

The comfort and safety of the workmen have been thoroughly studied, and there is unmistakable evidence of keen and careful management in all departments.

We are, Dear Sirs,
Faithfully yours,
WHEATLEY KIRK, PRICE, & GOULTY.

The value of the property to be acquired by the Company, therefore, is :—

Freehold Land and New Buildings with fixed and loose Plant, &c., as per valuation . . .	£51,419	8	7
Stock, Goods in Process, &c., which have been taken at the value standing in the Books at the last Stocktaking	15,132	14	4
Total	£66,552	2	11
To which must be added the Working Capital provided by this issue in addition to the Stock as above	7,000	0	0
Making a Total of . .	£73,552	2	11

Messrs. C. C. Wilson, Henry Wilson, James Wm. Wilson, Charles Albert Wilson, William Mathieson, Alex. Mathieson, and Thomas Arthur Draper, who have hitherto managed the business, and who are all practical and experienced men, will become Directors of this Company, and they have entered into an agreement with the Company under which their services are retained for a period of at least five years from the incorporation of the Company.

The whole of the present staff will be taken over by the Company and the continuity of its management will not be disturbed. It is intended to make an adequate allotment of Ordinary Shares among the employees of the Company.

The purchase price payable to the Vendors is £143,000, of which £10,000 is payable in Preference Shares, and £85,000 in Ordinary Shares, and the balance of £48,000 in cash.

The business is purchased as from the 1st January, 1899, and the profits from that date belong to the Company, and, as to that portion accruing up to date of allotment, will be applied (after deducting interest on the purchase price) towards the formation of a Reserve Fund. The Vendors will discharge all liabilities up to that date.

The Vendors pay all expenses of and incidental to the flotation of the Company and the issue of the Prospectus up to allotment, the Company to pay the cost of the actual transfer of the properties to the Company and the stamp duties thereon.

The Debentures and Shares of other public companies in a similar class of business stand well in the market, as will be seen from the following :—

Fletcher, Russell, & Co., Limited,
Pendleton and Warrington.

Ordinary £10 Shares, £7 10s. paid	19½— 20½
Ordinary £10 Shares, fully paid	25½— 25½
6 per cent. Preference Shares, £10 paid. . .	14¼— 14½
4 per cent. Debentures	102 —104

John Wright & Co., Limited, Birmingham.

Ordinary Shares, £5 paid	15½— 16
6 per cent. Preference Shares	7½— 7¾
5 per cent. Debentures	106 —109

The Contracts of Sale of the businesses of C. Wilson & Sons, and Mathieson, Wilson, and Co., are each dated the 1st June, 1899.

The business is taken over subject to all existing contracts, and as there are also numerous contracts relating to the trading and contracts with employees, customers, and others to which the Company is not a party, and which are too numerous to specify, applicants for shares will be deemed to have had notice of all such contracts and to have waived the insertion in this Prospectus of dates and names of the parties thereto and other particulars thereof, whether under Section 38 of the Companies Act, 1867, or otherwise.

The printed draft of the Trust Deed for securing the Debenture Stock and the Contracts for Sale above specified, together with the Memorandum and Articles of Association, Messrs. Wheatley Kirk, Price, & Goulty's Valuation, and Messrs. Beevers and Adgie's Certificate can be inspected at the offices of the Solicitors of the Company, Messrs. Simpson & Simpson, 47, Albion Street, Leeds.

Stock Exchange settlements and quotations will be applied for in due course.

Prospectuses can be obtained at the offices of the Company, and of the Bankers, Brokers, and Solicitors of the Company.

If no allotment is made the deposit will be returned in full, and, where the amount allotted is less than that applied for, the balance of the deposit will be applied toward the payment due on allotment, and any excess returned to the applicant.

Leeds, 1*st June*, 1899.

LEAMINGTON PRIORS GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Leamington Priors Gas Company are prepared to receive TENDERS for the supply of the GAS COAL required by them during Twelve Months from the 1st of July next. Particulars and Forms of Quotation may be obtained from the undersigned.

Tenders must be sent in on or before Monday, the 19th of June, 1899.

THOMAS TERRIDGE.

Gas Offices, Leamington Spa.

READING GAS COMPANY.

TAR.

THE Directors of the Reading Gas Company invite TENDERS for the purchase of their surplus TAR for One Year, commencing on the 1st of July next.

Specifications for the Contract will be forwarded on application.

Rail communication direct to the Works.

Tenders, endorsed "Tender for Tar," must be delivered not later than Monday, the 12th of June, to

ARTHUR H. CANE, Secretary.

7, King Street, Reading,
May 30, 1899.

BRIERLEY HILL DISTRICT GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the supply of 8000 Tons of GAS COAL, delivered to Brettell Lane or Round Oak Siding (G.W.R.), in such quantities as may be required from the 1st of July to the 30th of June, 1900.

Tenders, stating Price per ton (20 cwt.), delivered to the above-mentioned Stations, with latest Analytical Test, to be sent, addressed to the Chairman of the Company, and marked "Tender for Coal," not later than June 9 next.

The Directors reserve the right to accept Tenders for the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.

No Tender Forms issued.

By order,
HENRY M. JACKSON, Secretary.

Board-Room, Gas-Works,
Brierley Hill, May 29, 1899.

HAYWARDS HEATH DISTRICT GAS COMPANY.

GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of about 1500 to 2000 (more or less) tons of GAS COAL, to be delivered in such quantities and at such periods as may be ordered until the 30th of June, 1900.

The Coal required is to be unscreened, and to be delivered, in Trucks, free at the Haywards Heath Railway Station (London, Brighton, & South Coast Railway), either from the South Yorkshire or Durham Coal-Fields.

Payments, net cash monthly.

Tenders are to state the name of the Pits from which the above description of Coal will be supplied; the same to be fresh wrought, and free from Slate, and to the entire satisfaction of the Company's Manager.

The Board have no special Form of Tender, and do not bind themselves to accept the lowest or any Tender.

Tenders are to be received by me on or before the 12th day of June next, and endorsed "Tender for Gas Coal."

(Signed) ARTHUR H. CÆSAR, Secretary.

85, Gresham Street,
London, E.C.

GOOLE URBAN DISTRICT COUNCIL.

(GAS AND WATER COMMITTEE.)

TENDERS FOR GAS COAL.
TENDERS FOR STEAM COAL.
TENDERS FOR TAR.

COAL.

THE above Council are prepared to receive TENDERS for the supply of from:—

5000 to 6000 Tons of Best Screened, Unscreened, Cobbles, Nuts or Screened Slack GAS COAL

600 to 700 Tons of Best Screened STEAM COAL

in such quantities as the Council may direct from time to time for One Year from date of Contract.

The Gas Coal to be delivered free at the Lancashire and Yorkshire Siding in Bridge Street, the North-Eastern Railway Station, or by Boat on the Wharf of the Aire and Calder Canal at Goole, or the River Don alongside the Gas-Works.

The Steam Coal to be delivered alongside the Rawcliffe Pumping Station (near Goole) on the Aire and Calder Canal.

Tenders to state the Price per Ton of 20 cwt., weighed on delivery as per Clause No. 4, General Conditions.

TAR.

Tenders for the surplus TAR made during the year from July 1, 1899, the same to be made at a fixed price per ton (of 20 cwt.), delivered into Boat on the River Don alongside the Gas-Works, or into Tank-Trucks at the Lancashire and Yorkshire or North-Eastern Railway Sidings at Goole.

Tenders, endorsed and sealed, to reach George England, Clerk to the Council, Exchange Buildings, Goole, before the 24th day of June next.

The Council do not bind themselves to accept any Tender.

Further Information and Form of Tender may be had *(on written application only)* from the undersigned.

By order of the Committee,
MATT. DUNN, M.Inst.Mech.E., Engineer and Manager.

Engineers' Office,
Gas-Works, Goole,
May 31, 1899.

THE Urban District Council of Atherton invite TENDERS for the supply of 5000 Tons of screened GAS COAL during the Twelve Months commencing the 1st of July next.

Forms and Conditions of Tender may be had from the undersigned.

DANIEL SCHOFIELD, Clerk.

Atherton, near Manchester,
May 31, 1899.

KENT COUNTY ASYLUM, CHARTHAM DOWN, NEAR CANTERBURY.

TENDERS are invited for supplying one Bed of three GAS-RETORTS.

Details may be obtained on application to

THOS. BARTON, Steward.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Ashton Gas Company invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR to be produced at their Works during Twelve Months, commencing Aug. 1 next.

Probable quantities: Tar 2000 Tons; Ammoniacal Liquor 3000 Tons of 6°.

Tenders, duly endorsed, to be delivered at the Company's Offices on or before Saturday, the 17th day of June inst.

BARDSLEY ELSON, Secretary.

Gas Offices, Ashton-under-Lyne,
June 1, 1899.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Tottenham and Edmonton Gaslight and Coke Company are prepared to receive TENDERS for the purchase of the surplus COAL TAR produced at their Works between the 1st of July next and the 30th of June, 1900.

Also for the surplus CARBURETTED WATER-GAS TAR produced during the same period.

Terms and Conditions and all Particulars may be obtained on application addressed to the Engineer, Gas-Works, Tottenham.

Tenders cannot be received later than Nine a.m. on Friday, the 16th inst.

JAMES RANDALL, Secretary.

Gas Offices, Tottenham,
June 3, 1899.

BOROUGH OF ABERAVON.

THE Gas Committee of the Corporation are prepared to receive TENDERS for the supply of 300 Tons of CANNEL for a period of Twelve Months from the 1st of July next.

The Cannel is to be delivered in such quantities and at such times as may be ordered by Mr. W. G. Owen, Engineer and Manager.

Sealed Tenders, endorsed "Tender for Cannel," to be sent to the undersigned not later than the 17th of June, 1899.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
M. TENNANT, Town Clerk.

June 3, 1899.

BOROUGH OF BURTON-UPON-TRENT.

TAR.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS for the purchase of the surplus TAR to be produced at their Works during Twelve Months from the end of July next.

Probable quantity of Coal carbonized during the Twelve Months, 30,000 Tons.

The Tar will be delivered free into Contractor's Tank-Trucks, on the Gas-Works Railway Siding.

Payments: Net Cash Monthly.

Tenders, sealed, and endorsed "Tender for Tar," are to be delivered to me, at or before Ten a.m., on Thursday, the 29th of June inst.

The highest or any Tender will not necessarily be accepted.

F. L. RAMSDEN, Manager and Engineer.

Gas and Electric Light Works,
Burton-upon-Trent, June 1, 1899.

KENT WATER-WORKS.

TENDERS FOR COAL.

THE Directors of the Kent Water-Works Company invite TENDERS for the supply of SCREENINGS from the best DURHAM COAL at their Pumping Stations at Crayford, Orpington, and Wilmington, Kent, for One Year. Approximate weekly quantities: Crayford, 50 to 65 Tons; Orpington, 45 to 55 Tons; Wilmington, 70 to 90 Tons; or, alternatively, for the supply of such Coal in Cargoes f.o.b., or alongside in the River Thames, in a bulk supply of 10,000 Tons.

The Coal must be delivered in good and proper condition, and must evaporate not less than 7 lbs. of water for each pound of Coal, and be perfectly free from Slag or other mineral or earthy matter. The percentage of Ash and Clinker to be adopted as the agreed limit will be specified.

Payments monthly upon Engineer's Certificate.

The Directors do not bind themselves to accept the lowest or any Tender.

The Draft Contract can be inspected, and other Particulars obtained, at the Company's Offices, Mill Lane, Deptford.

Tenders, marked "Tenders for Coal," to be transmitted under seal on or before Monday, June 26, to

ALEXANDER DICKSON, Secretary of the Company.

June 3, 1899.

URBAN DISTRICT COUNCIL OF PADIHAM.

(GAS DEPARTMENT.)

THE Gas Committee of the above Council invite TENDERS for the supply of GAS COAL for One, Two, or Three Years. The Coal to be delivered as required at the Padiham Railway Station.

For Particulars apply to the undersigned.

Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Gas Coal," must be delivered to me not later than Saturday, June 24, 1899.

By order,
J. R. SMITH,
Gas Manager and Clerk to the Council.

District Council Offices, Padiham,
May 30, 1899.

PORTSEA ISLAND GASLIGHT COMPANY.

OIL.

THE Directors of the above Company are prepared to receive TENDERS for the supply of 125,000 Gallons of Oil for the manufacture of Carburetted Water Gas, to be delivered in Steamer alongside the Gas-Works (Flathouse) Portsmouth.

Specification and Form of Tender may be obtained on application to the undersigned.

Tenders to be addressed to the Chairman not later than Twelve noon, Thursday, June 22, 1899, and endorsed "Tender for Oil."

The Directors do not bind themselves to accept the lowest or any Tender.

J. D. ASHWORTH, Engineer.

Engineer's Office, Gas-Works,
Portsmouth, May 29, 1899.

TO COLLIERY PROPRIETORS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for GAS COAL, NUTS, and CANNEL for delivery during Twelve Months to the 30th of June, 1900.

The Quantities required will be approximately:—

Gas Coal and Nuts	185,000 Tons
Cannel	50,000 Tons

Tenders (forms for which can be obtained on application) must be delivered to the undersigned by post not later than the first post on Saturday, the 17th inst.

The Directors do not bind themselves to accept the lowest or any Tender.

HANBURY THOMAS, General Manager and Secretary.

Commercial Street, Sheffield,
June 2, 1899.

TIPTON GAS-WORKS.

COAL CONTRACTS.

THE Gas Committee of the Tipton Urban District Council are prepared to receive TENDERS for the supply of GAS COAL, for a period of One or Two Years, to be delivered carriage free to the Gas-Works Siding (L. & N.W. Railway).

Specifications and Form of Tender may be obtained at the Gas-Works on application to Mr. Vincent Hughes, the Engineer and Manager.

Sealed and endorsed Tenders to be sent to me the undersigned not later than Ten a.m. on Saturday, the 17th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
JNO. W. WARING, Clerk to the Council.

Public Offices, Tipton,
June 1, 1899.

COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply and erection of LIME and OXIDE ELEVATORS, &c., required at their Liverpool Street Works.

Copies of the Drawings and Specification and Form of Tender may be obtained (for which a charge of £1 will be made, to be returned on receipt of *bonâ-fide* Tender) by applying to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Elevators," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Wednesday, the 21st of June, 1899.

The lowest or any Tender will not necessarily be accepted.

By order,
L. C. EVANS, Town Clerk *(pro tem.)*.

Town Hall, Salford,
June 2, 1899.

URBAN DISTRICT COUNCIL OF OLDBURY.

(GAS DEPARTMENT.)

THE Gas Committee of this Council are open to receive TENDERS for the supply of 10,000 Tons, or thereabouts, of SCREENED GAS COAL, for delivery during the Year ending the 31st of August, 1900, in such quantities and at such times as ordered, carriage free at the (1) Oldbury Basin G.W. Railway, and (2) L. & N.W. Railway, Oldbury.

The Coal must be of First-class quality. Well Screened, Freshly Wrought, and perfectly free from Bats, Pyrites, and other Foreign Matter.

Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Coal," must be delivered to the undersigned not later than Saturday, June 17 next.

The Gas Committee do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to apportion the whole quantity as they may think fit.

Tender Forms and any other Information may be obtained from the undersigned on application in writing.

By order,
A. COOKE, General Manager.

Gas-Works, Oldbury,
May 30, 1899.

TENDERS FOR TAR.

THE Directors of the Aberdare and Aberaman Consumers' Gas Company invite TENDERS for the surplus TAR produced from about 5500 to 6000 Tons of COAL per annum, for One or Two Years from the 31st inst.

Railway Tanks may be forwarded per G.W.R. *viâ* Mountain Ash, or by other Railways, *via* the Taff Vale Station, Aberaman, to the Gas-Works, Aberaman, Aberdare.

Tenders (not necessarily accepted) to be addressed to the Chairman, and to be in his hands by Noon, on Monday, the 12th inst.

EVAN JONES,
Secretary and General Manager.

Gas-Works, Aberdare,
June 1, 1899.

LINCOLN CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Gas Committee of the Lincoln Corporation invite TENDERS for the supply of 28,000 Tons of screened GAS COALS and NUTS, to be delivered during a period commencing the 1st of July, 1899, and terminating the 30th of June, 1900.

Further Particulars and Forms of Tender may be obtained from the undersigned.

Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, must be delivered on or before the 24th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

JNO. CARTER,
Manager.

Gas Offices, Lincoln,
June 3, 1899.

LINCOLN CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas Committee of the Corporation of Lincoln are prepared to receive TENDERS for the purchase of the surplus TAR (1000 to 1200 Tons) produced at their Works during the period of One Year commencing on the 1st of July, 1899.

Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Residuals," must be delivered at the Gas Offices, Lincoln, on or before the 24th inst.

The Committee do not bind themselves to accept the highest or any Tender.

Other Particulars may be obtained of the undersigned.

JNO. CARTER,
Manager.

Gas-Works, Linco'n,
June 3, 1899.

COUNTY BOROUGH OF WEST BROMWICH.
(GAS DEPARTMENT.)

TO COLLIERY PROPRIETORS.

THE Gas Committee are prepared to receive TENDERS for the supply of 25,000 Tons of GAS COAL; also 1000 Tons of CANNEL COAL, for use at their Works, Albion, West Bromwich.

The Committee do not bind themselves to accept the lowest or any Tender; and they reserve to themselves the right to divide the Contract between several firms.

Forms of Tender may be obtained upon application to Mr. Thomas Glover, Manager of the Works.

Sealed Tenders, properly endorsed, to be sent to me not later than Friday, the 9th of June.

By order,
THOS. HUDSON,
Secretary.

Town Hall, West Bromwich,
May 20, 1899.

TAR, AMMONIACAL LIQUOR, AND LIME.

THE Directors of the Barnsley Gas Company invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR to be produced at their Works during a term of One or more Years, commencing July 1 next.

Also for the supply of the whole of the LIME required for Purifying purposes during the same periods.

Probable Quantities, and any other Particulars, on application to the undersigned.

Tenders, duly endorsed, addressed to the Chairman, to be delivered to me not later than Thursday, the 8th day of June prox.

The Directors do not bind themselves to accept the highest or any Tender.

By order,
WALTER W. HUTCHINSON,
Secretary and Manager.

Gas Offices, Barnsley,
May 25, 1899.

COUNTY BOROUGH OF BURY.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Corporation are prepared to receive TENDERS for the supply, for One, Two, or Three Years, of—

35,000 Tons of GAS COAL per annum.
500 " BURGY "
200 " HOUSE COAL "

The same to be delivered in such quantities and at such times as the Gas Engineer of the Corporation may from time to time order.

Printed Forms of Tender and Conditions of Contract may be obtained on application to Mr. H. Simmonds, Engineer and Manager, Gas-Works, Bury.

Tenders, which must be on the printed forms, and addressed to the Chairman of the Gas Committee, Town Clerk's Office, Bury, endorsed "Tender for Gas Coal," to be delivered not later than Friday, the 16th of June, 1899.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bank Street,
Bury, May 19, 1899.

THE INCORPORATED

Gas Institute.

THE THIRTY-SIXTH

ANNUAL GENERAL MEETING

OF THE MEMBERS

WILL BE HELD ON

Tuesday, Wednesday, and Thursday,

the 13th, 14th, and 15th of June, 1899,

AT THE

WESTMINSTER TOWN HALL,

CAXTON STREET, WESTMINSTER.

THE CHAIR WILL BE TAKEN BY THE PRESIDENT,

SAMUEL STEWART, Esq.

On Friday, June 16, there will be an Excursion up the Thames. Full Particulars will be announced in the Programme.

The Council expressly desire that Trading Firms will not send Representatives to the Meetings.

THE BENEVOLENT FUND.

The Annual General Meeting of the Donors and Subscribers to the Benevolent Fund will be held on Tuesday, June 13, at the close of the sitting, about Two p.m.

WALTER T. DUNN, Secretary.

13, *Victoria Street, Westminster, S.W.*

THE Urban District Council of Hindley are prepared to receive TENDERS for the supply of GAS COAL, CANNEL, ENGINE SLACK, and LIME required at their Gas-Works during the ensuing Twelve Months, and also for the purchase of the TAR and AMMONIACAL LIQUOR produced at their Gas-Works during the ensuing Twelve Months.

Full Particulars, with Form of Tender, can be obtained on application to Mr. William Dickinson, Gas and Water Manager.

Sealed Tenders, endorsed "Tender for Gas Coal, &c.," to be lodged with the undersigned not later than Monday, June 19, 1899.

By order,
STEPHEN HOLT,
Clerk to the Council.

Offices: Cross Street, Hindley,
May 29, 1899.

URBAN DISTRICT COUNCIL OF STOURBRIDGE.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of 14,000 Tons of good screened GAS COAL, or any part thereof, for delivery in equal Monthly quantities during the Year ending June 30, 1900.

Forms of Tender may be obtained on application to the Manager.

Sealed Tenders, endorsed "Tender for Gas Coal," to be addressed to the Chairman of the Gas Committee, and delivered to the undersigned on or before Tuesday, June 13, 1899.

WM. NORTH,
Engineer and Manager.

Gas-Works, Stourbridge,
May 23, 1899.

ROCHESTER, CHATHAM, AND STROOD GASLIGHT COMPANY.

TAR.

THE Directors are prepared to receive TENDERS for the purchase of the surplus TAR, to be produced at their Works at Rochester and Gillingham for One Year, commencing the 1st of July next.

The quantity will be about 300 000 gallons.

Sealed Tenders, endorsed "Tar," must be delivered to me, at these Offices, not later than Noon of Thursday, the 15th of June, 1899.

The Directors do not undertake to accept any Tender; and security for due fulfilment of the Contract must be given if required.

J. M. VEEVERS,
Engineer and General Manager.

Gas Offices, Rochester,
June 1, 1899.

SCARBOROUGH GAS COMPANY.

AMMONIACAL LIQUOR.

THE Directors of the Scarborough Gas Company invite TENDERS for the whole of the AMMONIACAL LIQUOR, to be produced at their Works for One or more Years from the 1st day of July next.

Tenders may be submitted either at a fixed Price per Ton or on a Sliding-Scale, regulated by the price of Sulphate. Preference will, however, be given to the latter.

Further Particulars may be obtained on application to the undersigned.

Tenders (duly endorsed) must be delivered, addressed to the Chairman of the Company, not later than Noon, on Saturday, the 10th of June next.

The Directors do not bind themselves to accept the highest or any Tender.

By order,
J. HOLLIDAY,
Engineer and Secretary.

Gas Offices: 32, Westborough,
Scarborough, May 17, 1899.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to DEBENTURE STOCK and BONDS, WILL BE CLOSED at One o'clock p.m. on Saturday, the 10th inst., for the Half Year ending on the 30th inst., and WILL BE RE-OPENED on the morning of Monday, the 12th inst.

The Interest for the Half Year will be payable on the 1st of July next to the Proprietors registered on the closing of the Books.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., June 1, 1899.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

WESTGATE AND BIRCHINGTON GAS COMPANY.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, London, E.C., on Wednesday, June 14, at Two o'clock, precisely

500 £10 "C" SHARES
IN THE
WESTGATE AND BIRCHINGTON GAS COMPANY,

Ranking for a Maximum Dividend of 7 per cent., and entitled, in view of the distribution on the Company's Ten per Cent. Capital to the 31st of December last, to a *pro raté* Dividend of £4 9*s.* per cent.

Particulars of Messrs. HOUSEMAN & Co., Solicitors, 3, Prince's Street, Storey's Gate, WESTMINSTER, S.W.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

LOWESTOFT WATER AND GAS COMPANY.

500 £10 (FULLY PAID) ADDITIONAL ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, June 28, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND GAS COMPANY.

£10,000 OF FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, June 28, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

SOUTHEND WATER-WORKS COMPANY.

500 £10 SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, June 28, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

WALKER AND WALLSEND UNION GAS COMPANY.

SALE OF CONSOLIDATED STOCK.

THE Directors have instructed Mr ROBERT MACK to SELL BY AUCTION, at the Offices of the Newcastle-upon-Tyne and Gateshead Gas Company, 35, Grainger Street West, Newcastle-upon-Tyne, on Tuesday, the 6th day of June, 1899, at Twelve o'clock noon, £7500 CONSOLIDATED STOCK of the Company, to be issued under the powers of the Company's Act of 1884.

For Conditions of Sale and further Particulars, apply to the undersigned.

CHAS. H. ARMSTRONG,
Secretary.

Offices: Mitchell Street,
Walker-on-Tyne, May 6, 1899.

IMPORTANT SALE OF GAS SHARES.

MR. W. H. SWANNELL has received Instructions from the Directors of the Rickmansworth Gaslight and Coke Company, Limited, to SELL BY AUCTION, at the Town Hall, Rickmansworth, on Wednesday, June 7, 1899, at Five o'clock precisely, 700 NEW £5 SHARES; being the issue of Additional Capital of the said Company, ranking for a prescribed rate of Dividend not exceeding 7 per cent., subject to the Sliding-Scale mentioned in the Rickmansworth Gas Order, 1885.

Particulars and Conditions of Sale may be had of HARVEY W. FELLOWS, Esq., Solicitor, RICKMANSWORTH; and of the AUCTIONEER, High Street, RICKMANSWORTH.

CROMER GAS COMPANY—£450 Ordinary Stock; Dividend 4 per cent.

WYMONDHAM GASLIGHT AND COKE COMPANY, LTD.—67 £5 Ordinary Shares; Dividend 5 per cent.

GAS LIGHTING IMPROVEMENT COMPANY, LTD.—500 £1 Shares; Dividend 10 per cent.

MESSRS. EDWIN FOX & BOUSFIELD will include in their next Stock and Share Auction at the Mart, on Wednesday, June 14, at 2.30 o'clock, in Lots, the above.

Particulars at their Office, 99, Gresham Street, BANK, E.C.

GAS AS A FUEL

BY

LAWSON TAIT,

LL.D., M.D., F.R.C.S.,

Formerly Chairman of Birmingham Health Committee, President of Mason's Science College, &c., &c.

MR. LAWSON TAIT puts the case for gaseous fuel so clearly and pointedly that all those who are interested in the smoke-abatement problem will read the lecture with profit. . . . . Coal firing is the main origin of the fog fiend, and the more the public realize this and act upon it, the better prospect will there be of freeing the air which we breathe from a dangerous and ugly impurity.—*Lancet, May* 6, 1899.

PRICE ONE PENNY.

Quotations for quantities on application.

BIRMINGHAM:

HUDSON & SON, EDMUND ST., AND LIVERY ST.

ENRICH YOUR GAS

WITH CHEAP

BENZOL,

SPECIALLY PREPARED, FREE FROM SULPHUR.

AT to-day's Price of Benzol, Illuminating POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.

Apply to SADLER & CO., MIDDLESBROUGH.

TUBES AND FITTINGS

ALL KINDS

WRITE FOR PRICES

STAFFORDSHIRE TUBE Co, BIRMINGHAM.

ARMSTRONG'S

PATENT

CANDLE SAFETY LAMPS

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

48, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per Ton . .	10,500 Cubic Feet.
Illuminating Power . . .	16·4 Candles.
Coke	68 per Cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

The Wallsend & Hebburn Coal Company, Ltd.

B Lombard Street,

NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

THE ACETYLENE ILLUMINATING CO., LTD.,

MANUFACTURERS OF CARBIDE OF CALCIUM,

63, QUEEN VICTORIA STREET, LONDON, E.C.,

and FOYERS, SCOTLAND.

(The Acetylene Illuminating Company, Limited, Incorporated in May, 1895, as a Private Development Company, was the First Undertaking established in Europe for the Manufacture of Carbide of Calcium.)

NOTICE.

THE Acetylene Illuminating Company, Limited, possesses an exclusive Licence for the United Kingdom to use for the manufacture of Carbide of Calcium for Light, Heat, and Power Purposes, the Inventions which are comprised in Mr. Willson's British Letters Patent. The Company is also similarly licensed under the British Letters Patent owned by the British Aluminium Company, Limited, so far as these relate to the manufacture of Carbide of Calcium for the same purposes.

The Patents have been submitted to Mr. Fletcher Moulton, Q.C., Mr. Roger Wallace, Q.C., and Mr. Arthur Colefax, who have given the following joint opinion:—

"In our opinion The Acetylene Illuminating Company, Limited, by their Patents control the process "by which alone Calcium Carbide can be commercially produced by electricity, and are also "entitled thereunder to prevent the importation into "this country of Calcium Carbide so produced."

The Acetylene Illuminating Company, Limited, are determined to permit of no Infringement of their Patent Rights, and have brought an Action against the Midland Acetylene (Parent) Syndicate, Limited, to restrain them from manufacturing Carbide of Calcium by means of the Electric Furnace. The Acetylene Illuminating Company intend in future to bring actions against all Infringers of their Patents, whether Manufacturers or Importers, and against all Purchasers of Carbide of Calcium made or imported in Infringement of their Patent Rights.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

THE READ-HOLLIDAY ACETYLENE COMPANY, LIMITED, Acetylene Gas Engineers and Carbide of Calcium Manufacturers, HUDDERSFIELD.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

TINKER AND HOLLIDAY, LIMITED, Carbide of Calcium Manufacturers, HAZELHEAD, SHEFFIELD.

NITRATE of Thorium and Cerium. FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available Output up to 5000 Tons per day.

Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by

Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD

SEAHAM HARBOUR, COUNTY OF DURHAM.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per Ton. .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to

W. H. PARKINSON,

THE HARTON COAL CO., LTD.,

NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE

90, CANNON STREET, E.C.

HOLMSIDE

GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . .	11,205 Cubic Feet.
Illuminating Power	16$\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR

PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES

NEWCASTLE-UPON-TYNE.

HISLOP'S PATENT REGENERATIVE RETORT-SETTINGS

These Settings are Testified to and guaranteed to produce **more Gas per day,** to be more **simple** in **Management,** to have **greater Durability,** to be **more Economical** in **Labour** and **Fuel,** and to have the **Lowest Cost for Renewals** of any system in the Market. Gas Engineers and Managers would do well to give these advantages their careful consideration, when contemplating extension of their Retort-Benches, or when filling existing Ovens.

Further Particulars from the Principal Agent, or from C. M. HAMILTON, Retort Builder, Hamilton, Agent for Scotland & Ireland.

NOTE: **The Agency held by Messrs. Drake & Son, Halifax, for England, Wales, and Abroad has now ceased; and they have no authority whatever to represent the Patentee, although persistently advertising themselves as Agents.**

All Enquiries to be addressed to R. F. HISLOP, Gas Engineer, CRAIGIELEA, PAISLEY.

G. & J. HAIGH,

Raven's Lodge Fire-Brick Works, DEWSBURY.

Manufacturers of MACHINE-MADE RETORTS and

FIRE-BRICKS of the highest Quality, made from Fire-Clay of a most Superior and Refractory Character, suitable for **GLASS-WORKS, GAS-WORKS, and BLAST-FURNACES**

For Prices and Analysis, apply as above.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland District Office: PRINCE'S CHAMBERS, 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

Telegraphic Address: "PARKER, LONDON."

WORKMANSHIP and MATERIALS OF THE HIGHEST QUALITY.

PECKETT'S LOCOMOTIVES

Built to any Specification or Gauge.

PECKETT & SONS, Atlas Locomotive Works, **BRISTOL.**

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UP-TO-DATE FURNACES AND SETTINGS.

J. & H. ROBUS, 20, Bucklersbury, London, E.C.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

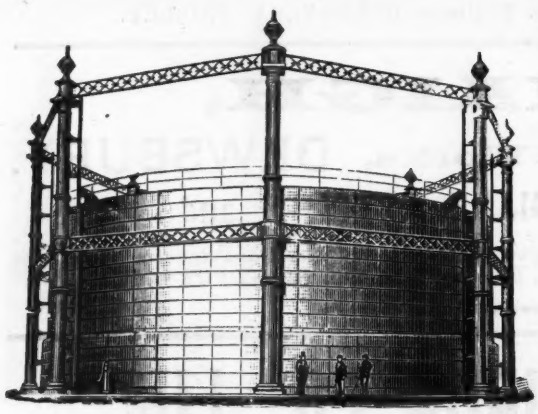
ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."



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GAS ENGINEERS,

MANUFACTURERS, IRONFOUNDERS, & CONTRACTORS.

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LINCOLN.

Telegraphic Address: "PORTER LINCOLN." National Telephone, No. 18.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

References to 600 Works already erected.

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Established 1858. The First Manufactory of Silica and Dinas Fire-Bricks erected in England.

MANUFACTURERS OF

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(TRADE MARK "SILICA")

Specially adapted for Siemens-Martin Gas-Furnaces; also for Gas, Copper, Iron, Steel, and other Furnaces where intense heat is required.

BESSEMER GANNISTER, STEEL-FURNACE GANNISTER, COPPER-FURNACE GANNISTER, IRONFOUNDERS' CUPOLA SAND FINE-SETTING SILICA CEMENT, STEEL MOULDERS' COMPOSITION.

Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.

MOBBERLEY & PERRY

STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

LONDON AGENTS: Contractors for the erection of Retort-Benches complete.

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ARROL-FOULIS

PATENT HYDRAULIC MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS

SIR WILLIAM ARROL & CO., Ltd., Sole Makers,
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LONDON ADDRESS: 32 VICTORIA STREET, WESTMINSTER, S.W.

PLANS AND ESTIMATES FURNISHED ON APPLICATION.

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ARROL-FOULIS
MACHINES
Are Employed at the following Works—

GLASGOW GAS-WORKS—
Tradeston.
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SOUTH METROPOLITAN GAS COMPANY—
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COMMERCIAL GAS-WORKS—
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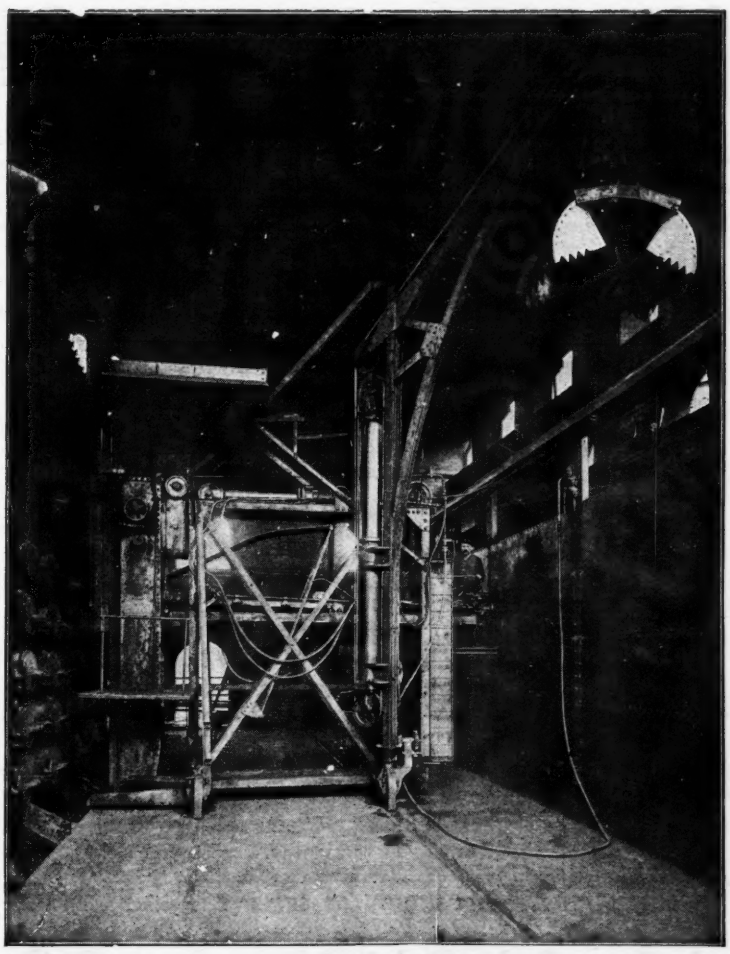
BROMLEY GAS-WORKS (KENT).

EDINBURGH GAS-WORKS.

LIVERPOOL GAS-WORKS.



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CLEVELAND GAS-WORKS—
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&c., &c., &c.

OVER 200 MACHINES ARE AT WORK OR IN COURSE OF CONSTRUCTION.

WAPPING GAS-WORKS.

THE TIME TAKEN TO DRAW AND CHARGE EACH RETORT BY THESE MACHINES AVERAGES

ONE MINUTE.

OIL FOR GAS MAKING

PURE DISTILLATE.

HOMOGENEOUS IN CHARACTER.

NO MIXTURE.

CAN BE STORED SAFELY ANYWHERE.

FLASH POINT GUARANTEED OVER 200° FAHR.

(ABEL'S CLOSED TEST.)

ANGLO-CAUCASIAN OIL COMPANY, LTD.

8, 9, 10, & 11, LIME STREET, LONDON, E.C. | INDIA BUILDINGS, CROSS ST., MANCHESTER.

ESTABLISHED 1844. **ORIGINAL MAKERS.** ESTABLISHED 1844.

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

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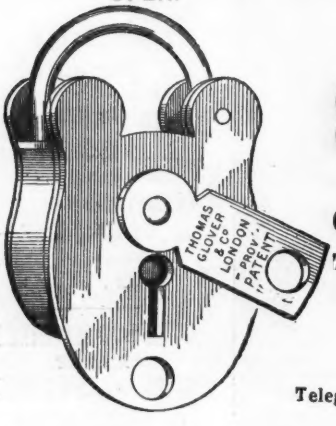

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PATENT

SECURE PADLOCK

PREVENTS TAMPERING WITH THE

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

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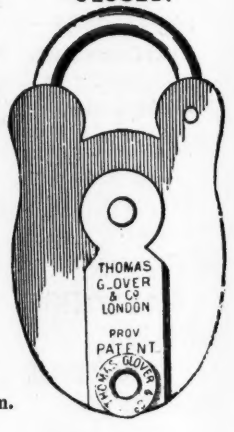

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 725, Holborn.

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DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 28, BATH STREET. *Telegraphic Address: "GOTHIC."* **Telephone No. 1003.**

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."* **Telephone No. 3098.**

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WEST'S GAS IMPROVEMENT CO., LTD.

Gas and General Engineers,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,
AND
104, QUEEN VICTORIA STREET, LONDON, E.C.

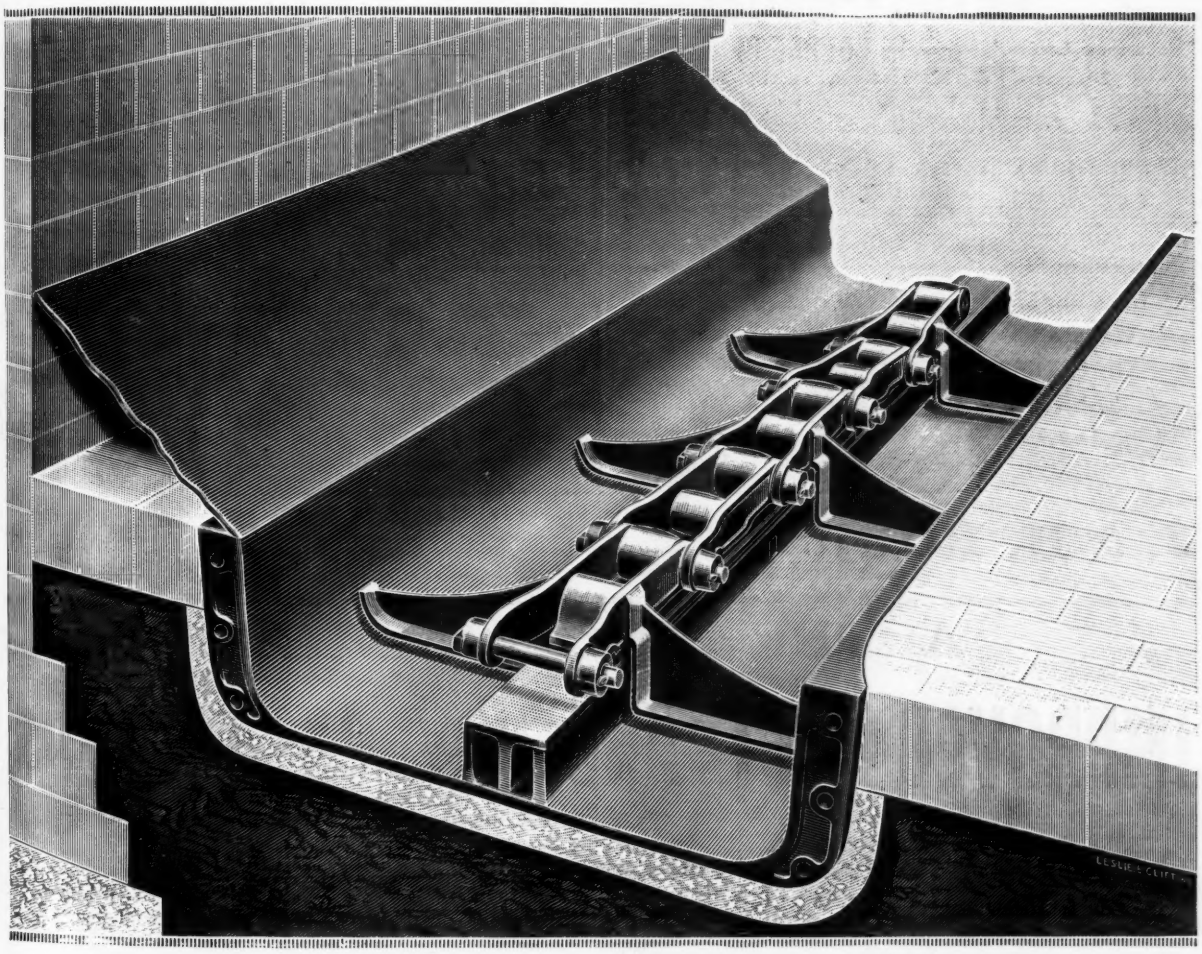
SOLE MANUFACTURERS OF

West's Patent Silent COKE-CONVEYOR

For Conveying, Elevating, Storing, and Stacking

HOT COKE from GAS-RETORTS and COKE-OVENS.

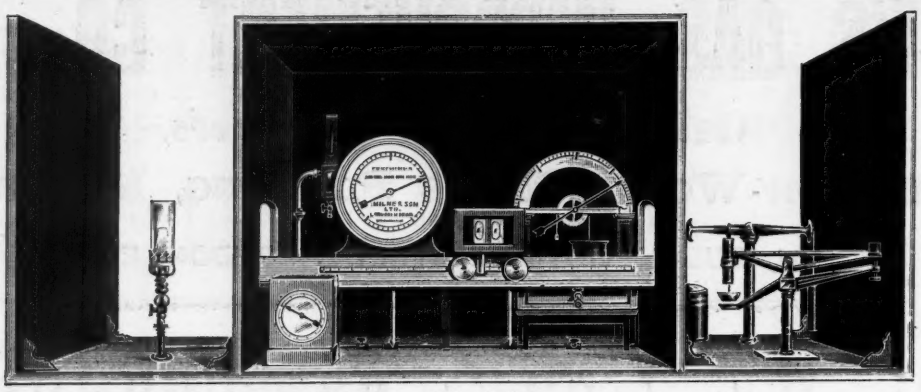
These Conveyors are fitted with Hunt's Patent Anti-Friction Roller Chain, which is especially adapted for this purpose.



SPECIAL FEATURES.

Simplicity in Design, and does not damage the Coke.
Silent in action.
The Roller Chain ensures long life to the Chains and Chain Wheels.

CATALOGUES AND PAMPHLETS ON APPLICATION.



Simple Form of Photometrical Apparatus as made by

JAMES MILNE & SON, LTD.

GAS ENGINEERS

Milton House Works EDINBURGH.

LONDON. GLASGOW. LEEDS.

Telegrams: "Robustness, London."

RETORT-HOUSE, SETTINGS, & RAILWAY

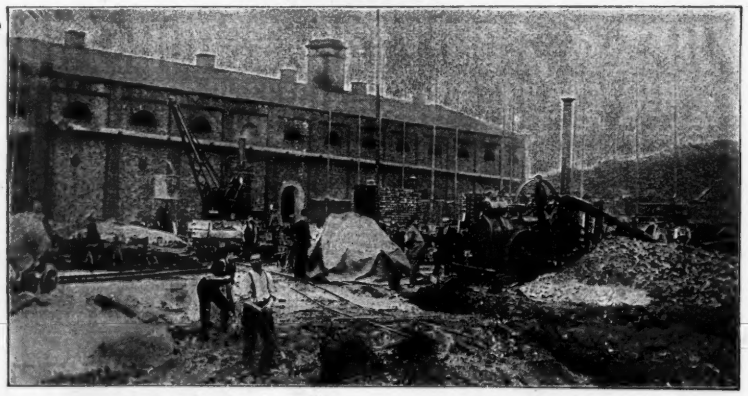
IN COURSE OF ERECTION BY OUR OWN WORKMEN.

Telephone: No. 756 Bank.

Plans, Estimates, and Specifications prepared and submitted.

Special Facilities for RECONSTRUCTING GAS-WORKS.

CONDENSERS, SCRUBBERS, WASHERS, EXHAUSTERS, TANKS, and every REQUISITE.



A SPECIALITY.

INCLINED and FLOOR-LEVEL SETTINGS with or without REGENERATIVE or GENERATOR FURNACES, with or without IRONWORK.

COMPLETE RE-SETTING.

J. & H. ROBUS, Engineers and Contractors, 20, BUCKLERSBURY, LONDON, E.C.

GASHOLDER TANKS AND MAIN LAYING.

ALDER AND MACKAY,

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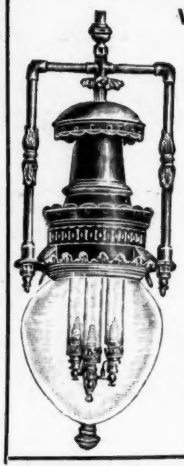

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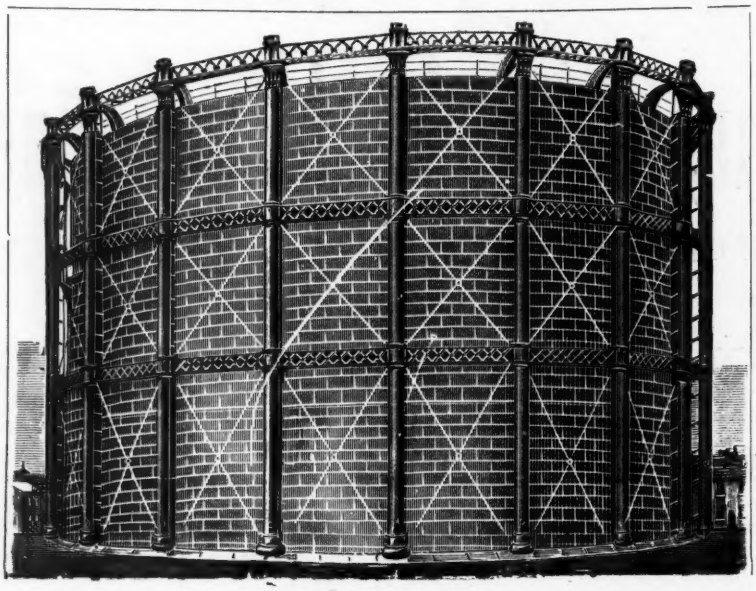

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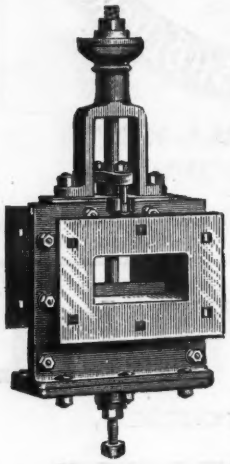

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